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# TABLE OF CONTENTS

| | Page |
|---|---|
| The Increasing Significance of Geographic Conditions in the Growth of Nation-States ... Wallace W. Atwood | 1 |
| Are We Free to Coin New Terms? ... J. Russell Smith | 17 |
| William Morris Davis—Leader in Geomorphology and Geography Kirk Bryan | 23 |
| Titles and Abstracts of Papers Presented before the Association at Philadelphia, Pennsylvania, December, 1934 ... | 32 |
| Exhibits at the Philadelphia Meeting ... | 62 |
| Climatic Effects of the Proposed Wooded Shelter Belt Stephen S. Visher | 63 |
| On the Merits of Regional Diagrams in Field Reports: with an Illustration ... Ralph H. Brown | 75 |
| The Impress of Effective Central Authority upon the Landscape Derwent Whittlesey | 85 |
| A Classification of the Agricultural Regions of Europe and North America on a Uniform Statistical Basis Richard Hartshorne and Samuel N. Dicken | 99 |
| A Conference on Regions ... | 121 |
| The Geographic Region: A Résumé ... Robert Burnett Hall | 122 |
| The Statistical Approach to Regions ... G. T. Renner | 137 |
| Field Approach to Regions ... Robert S. Platt | 153 |
| Johnstown and York: A Comparative Study of Two Industrial Cities ... Raymond E. Murphy | 175 |
| A Study of Population Regions in New England on a New Basis Stanley D. Dodge | 197 |
| Dissertations in Geography Accepted by Universities in the United States for the Degree of Ph.D. as of May, 1935 ... | 211 |
| Officers of the Association of American Geographers, 1904–1935 ... | 238 |

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# INDEX TO VOLUME XXV, 1935

## *Annals of the Association of American Geographers*


PAGE

Abstracts and Titles of Papers Presented before the Association at Philadelphia, Pennsylvania, December, 1934 ..... 32
American Finland, An, Darrell H. Davis (abstract) ..... 38
Are We Free to Coin New Terms? J. Russell Smith ..... 17
ATWOOD, ROLLIN S., The Inter-Community Trade of the Indians of the Utatlan Basin in Guatemala (abstract) ..... 32
ATWOOD, WALLACE W., The Increasing Significance of Geographic Conditions in the Growth of Nation-States ..... 1
ATWOOD, WALLACE W., Jr., Erosional History of the Wind River Range, Wyoming (abstract) ..... 33

BARNES, C. P., The Long-lot Farm and Economy in Public Services (abstract) 34
BATSCHELET, C. E., Problems Involved in Compiling the State Minor Civil Division Maps (abstract) ..... 35
Brief Report on the International Congress of Geography, Warsaw, August 23–31, 1934, John K. Wright (Editor's note) ..... 61
BROOKS, CHARLES F., Thirty Climatic Maps of North America (abstract) 36
BROWN, RALPH H., On the Merits of Regional Diagrams in Field Reports: with an Illustration ..... 75
BROWN, ROBERT M., The Business of Recreation: a Preliminary Study (abstract) ..... 37
BRYAN, KIRK, William Morris Davis—Leader in Geomorphology and Geography ..... 23
Business of Recreation: a Preliminary Study, The, Robert M. Brown (abstract) 37

Caravan Cities, Climate, and History, Ellsworth Huntington (abstract) ..... 45
CARLSON, FRED A., Hydrography of the Valley of Mexico (abstract) ..... 38
Classification of the Agricultural Regions of Europe and North America on a Uniform Statistical Basis, A, Richard Hartshorne and Samuel N. Dicken .... 99
Climatic Effects of the Proposed Wooded Shelter Belt, Stephen S. Visher ..... 63
Coastal Marshes of Southwestern Louisiana, Richard Joel Russell (abstract) ... 54
Common Statistical Basis for Delimiting the Agricultural Regions of Europe and North America, A, Richard Hartshorne and Samuel N. Dicken (abstract) ... 41
Compiling the State Minor Civil Division Maps, Problems Involved in, C. E. Batschelet (abstract) ..... 35
Conference on Regions, A ..... 121
Corn Belt, Corn, Climate, and Statistical Method in the, John Kerr Rose (abstract) ..... 53
Corn, Climate, and Statistical Method in the Corn Belt, John Kerr Rose (abstract) ..... 53
CRESSEY, GEORGE B., The Fenghsien Landscape: Human Adjustments in the Yangtze Delta (abstract) ..... 38

DAVIS, DARRELL H., An American Finland (abstract) ..... 38
Davis, William Morris—Leader in Geomorphology and Geography, Kirk Bryan 23

PAGE

Detroit, Michigan, A New Population Map of, Floyd A. Stilgenbauer (abstract) 56
Development of Manufacturing in Hamilton, Ontario, The, Harold B. Ward (abstract) ..... 59
DICKEN, SAMUEL N., and RICHARD HARTSHORNE, A Classification of the Agricultural Regions of Europe and North America on a Uniform Statistical Basis ..... 99
DICKEN, SAMUEL N., and RICHARD HARTSHORNE, A Common Statistical Basis for Delimiting the Agricultural Regions of Europe and North America (abstract) ..... 41
Dissertations in Geography Accepted by Universities in the United States for the Degree of Ph.D. as of May, 1935 ..... 211
Distribution of Industries in São Paulo State, Brazil, The, Preston E. James (abstract) ..... 46
DODGE, STANLEY D., A Study of Population Regions in New England on a New Basis ..... 197
DODGE, STANLEY D., Population Regions of New England, and Their Significance in the Analysis of the Culture Landscape (abstract) ..... 39
DOMINIAN, LEON, Preliminary Notes on the Geographical Basis of the Spirit of Tolerance (abstract) ..... 40

Erosional History of the Wind River Range, Wyoming, Wallace W. Atwood, Jr. (abstract) ..... 33
European Russia, Geographic Regions of, George David Hubbard (abstract) .... 43
Evaporation of Snow on Our Western Mountain Ranges, François E. Matthes (abstract) ..... 49
Exhibits at the Philadelphia Meeting ..... 62

Fenghsien Landscape: Human Adjustments in the Yangtze Delta, The, George B. Cressey (abstract) ..... 38
Field Approach to Regions, Robert S. Platt ..... 153
Frost Maps of Nebraska, A Variability Series of, Earl E. Lackey (abstract) .... 47

Geographic Conditions in the Growth of Nation-States, the Increasing Significance of, Wallace W. Atwood ..... 1
Geographic Region: A Résumé, The, Robert B. Hall ..... 122
Geographic Regions of European Russia, George David Hubbard (abstract) .... 43
Geographical Interpretation of the Japanese Population Curve, A, Howard H. Martin (abstract) ..... 48

HALL, ROBERT B., The Geographic Region: A Résumé ..... 122
Hamilton, Ontario, The Development of Manufacturing in, Harold B. Ward (abstract) ..... 59
HARTSHORNE, RICHARD, and SAMUEL N. DICKEN, A Classification of the Agricultural Regions of Europe and North America on a Uniform Statistical Basis ..... 99
HARTSHORNE, RICHARD, and SAMUEL N. DICKEN, A Common Statistical Basis for Delimiting the Agricultural Regions of Europe and North America (abstract) ..... 41
HARTSHORNE, RICHARD, The History, Nature and Scope of Political Geography (abstract) ..... 40
Henry S. Tanner of Philadelphia: His Place in American Cartography, 1815–1850, W. L. G. Joerg (abstract) ..... 46

PAGE

History, Nature and Scope of Political Geography, The, Richard Hartshorne (abstract) ..... 40
HOBBS, WILLIAM H., Peary and His Polar Explorations (abstract) ..... 42
HUBBARD, GEORGE DAVID, Geographic Regions of European Russia (abstract) ..... 43
HUDSON, G. DONALD, A Quantitative Approach to Land Use Problems (abstract) ..... 44
HUNTINGTON, ELLSWORTH, Caravan Cities, Climate, and History (abstract) ..... 45
Hydrography of the Valley of Mexico, Fred A. Carlson (abstract) ..... 38

Impress of Effective Central Authority upon the Landscape, The, Derwent Whittlesey ..... 85
Increasing Significance of Geographic Conditions in the Growth of Nation-States, The, Wallace W. Atwood ..... 1
Inter-Community Trade of the Indians of the Utatlan Basin in Guatemala, The, Rollin S. Atwood (abstract) ..... 32
Internal Migration in the United States, C. Warren Thornthwaite (abstract) ..... 58

JAMES, PRESTON E., The Distribution of Industries in São Paulo State, Brazil (abstract) ..... 46
JOERG, W. L. G., Henry S. Tanner of Philadelphia: His Place in American Cartography 1815–1850 (abstract) ..... 46
Johnstown and York: A Comparative Study of Two Industrial Cities, Raymond E. Murphy ..... 175

KLIMM, LESTER E., The Rain Tanks of the Aran Islands of Ireland—A New Adjustment to Karst Conditions (abstract) ..... 47

LACKEY, EARL E., A Variability Series of Frost Maps of Nebraska (abstract) 47
Long-lot Farm and Economy in Public Services, The, C. P. Barnes (abstract) .. 34

MARTIN, HOWARD H., A Geographical Interpretation of the Japanese Population Curve (abstract) ..... 48
MATTHES, FRANÇOIS E., Evaporation of Snow on Our Western Mountain Ranges (abstract) ..... 49
Meander-scroll and Meander-bar Plains, Frank A. Melton (abstract) ..... 50
MELTON, FRANK A., Meander-scroll and Meander-bar Plains (abstract) ..... 50
MURPHY, RAYMOND E., Johnstown and York: A Comparative Study of Two Industrial Cities ..... 175

New Method for Making Relief Models, A, T. Yates Wilson (abstract) ..... 60
New Population Map of Detroit, Michigan, A, Floyd A. Stilgenbauer (abstract) 56

Officers of the Association of American Geographers, 1904–1935 ..... 238
On Some Possibilities and Limitations of Air Mass Climatology, Robert G. Stone (abstract) ..... 56
On the Merits of Regional Diagrams in Field Reports: with an illustration, Ralph H. Brown ..... 75

Peary and His Polar Explorations, William H. Hobbs (abstract) ..... 42

PAGE

Physiographic Maps of the Sahara Desert and Adjacent Regions, Erwin Raisz (abstract) ..... 52
Physiographic Nomenclature à la William Morris Davis, Vera E. Rigdon (abstract) ..... 52
PLATT, ROBERT S., Field Approach to Regions ..... 153
Political Geography, The History, Nature and Scope of, Richard Hartshorne (abstract) ..... 40
POOLE, SIDMAN P., The Rôle of Geography in State Planning (abstract) ..... 51
Population Regions of New England, and Their Significance in the Analysis of the Culture Landscape, Stanley D. Dodge (abstract) ..... 39
Preliminary Notes on the Geographical Basis of the Spirit of Tolerance, Leon Dominian (abstract) ..... 40
Problems Involved in Compiling the State Minor Civil Division Maps, C. E. Batschelet (abstract) ..... 35

Quantitative Approach to Land Use Problems, A, G. Donald Hudson (abstract) 44

Rain Tanks of the Arian Islands of Ireland—A New Adjustment to Karst Conditions, The, Lester E. Klimm (abstract) ..... 47
RAISZ, ERWIN, Physiographic Maps of the Sahara Desert and Adjacent Regions (abstract) ..... 52
Regionalism in the Manufacturing Industry, Helen M. Strong (abstract) ..... 57
RENNER, G. T., The Statistical Approach to Regions ..... 137
RIGDON, VERA E., Physiographic Nomenclature à la William Morris Davis (abstract) ..... 52
Rôle of Geography in State Planning, The, Sidman P. Poole (abstract) ..... 51
ROSE, JOHN KERR, Corn, Climate, and Statistical Method in the Corn Belt (abstract) ..... 53
RUSSELL, RICHARD JOEL, Coastal Marshes of Southwestern Louisiana (abstract) ..... 54

Sahara Desert and Adjacent Regions, Physiographic Maps of the, Erwin Raisz (abstract) ..... 52
São Paulo State, Brazil, The Distribution of Industries in, Preston E. James (abstract) ..... 46
Sequent Occupance in "Old" Boston, Derwent Whittlesey (abstract) ..... 60
SMITH, J. RUSSELL, Are We Free to Coin New Terms? ..... 17
SMITH, THOMAS R., The World Wheat Surplus (abstract) ..... 54
Statistical Approach to Regions, The, G. T. Renner ..... 137
STILGENBAUER, FLOYD A., A New Population Map of Detroit, Michigan (abstract) ..... 56
STONE, ROBERT G., On Some Possibilities and Limitations of Air Mass Climatology (abstract) ..... 56
STRONG, HELEN M., Regionalism in the Manufacturing Industry (abstract) 57
Study of Population Regions in New England on a New Basis, A, Stanley D. Dodge ..... 197

Thirty Climatic Maps of North America, Charles F. Brooks (abstract) ..... 36
THORNTHWAITE, C. WARREN, Internal Migration in the United States (abstract) ..... 58
Titles and Abstracts of Papers Presented before the Association at Philadelphia, Pennsylvania, December, 1934 ..... 32

Variability Series of Frost Maps of Nebraska, A, Earl E. Lackey (abstract) ..... 47
VISHER, STEPHEN S., Climatic Effects of the Proposed Wooded Shelter Belt 63

WARD, HAROLD B., The Development of Manufacturing in Hamilton, Ontario (abstract) ..... 59
WHITTLESEY, DERWENT, The Impress of Effective Central Authority upon the Landscape ..... 85
———————————, Sequent Occupance in "Old" Boston (abstract) 60
WILSON, T. YATES, A New Method for Making Relief Models (abstract) ... 60
Wind River Range, Wyoming, Erosional History of the, Wallace W. Atwood, Jr. (abstract) ..... 33
World Wheat Surplus, The, Thomas R. Smith (abstract) ..... 54
WRIGHT, JOHN K., Brief Report on the International Congress of Geography, Warsaw, August 23–31, 1934 (Editor's note) ..... 61

ANNALS

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# The Increasing Significance of Geographic Conditions in the Growth of Nation-States[1]

WALLACE W. ATWOOD

This evening I invite you to lay aside your highly specialized interests in the various fields of geographical research and think of the influence which the various environmental factors have had upon the location and development of nation-states, and particularly upon the location and development of those nation-states which are today recognized to be the great world powers. In the end I hope to present what appeals to me to be logically a wonderful opportunity and a great responsibility which geographers have for service in a field in which there has been terrifying retrogression during the last decade.

## THE ESTABLISHMENT OF EARLY SETTLED COMMUNITIES

A long time ago when women learned from the winds the art of wafting the seeds of food-producing grasses, agriculture began. Men were slowly led to abandon hunting and the gathering of fruits and roots as the chief means of providing food for their families. They cooperated with the women in the building of homes and settled communities soon came into existence. Those very ancient communities were widely scattered, isolated, and self-sufficient. They could not cooperate, they could not understand each other, for with a few possible exceptions they knew not of each other's

[1] Presidential address delivered before the Association of American Geographers, Philadelphia, Pennsylvania, December, 1934.

existence. A few examples will illustrate the conditions of those communities in very early days.

*The Mayan Communities.* A thousand years before the birth of Christ the Mayan people, living on the somewhat inaccessible subtropical highlands of Central America, developed a remarkable culture. Their life was based chiefly upon the cultivation of the soil in great intermontane basins partially filled with volcanic ash.

Dr. Spinden states that: "The Mayas produced one of the few really great and coherent expressions of beauty so far given to the world and their influence in America was historically as important as was that of the Greeks in Europe."[2]

*The Pre-Inca People.* In the Central Andes the pre-Inca and later the Inca peoples developed advanced communities. They were chiefly agricultural people but they made notable progress in art, architecture and engineering. Their habitat was bordered on the west by the extremely dry coastal desert and on the east by the dense and insect-infested tropical rain forest.

There must have been considerable cooperation among the people within each of the early settled communities in the western hemisphere for those people completed remarkable engineering tasks and developed forms of community government. However, there was no cooperation between the different communities.

*Eastern Mediterranean Settlements.* In the settlements which existed six or seven thousand years ago on the banks of the Nile and in the lands between the Tigris and Euphrates rivers agriculture was the chief occupation of the people. River-made lowlands, hemmed in by deserts, were cultivated intensively. Cooperation within each group was undoubtedly necessary for large irrigation projects were undertaken. For a long time the people in those regions were isolated from the rest of the world. Artistic and scholarly work was carried on, great buildings were erected and progress was made in the establishment of forms of government.

The island of Crete served for more than a thousand years, during this very ancient period, as another isolated cradle, where civilization could be advanced. At no place and at no time have more beautiful pieces of decorative art been completed than those produced on this island in the 19th and 20th centuries before Christ. Much of the Hellenic and Roman culture which developed hundreds of years later may be traced back to this tiny island.

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[2] Spinden, Herbert J., Ancient Civilization of Mexico and Central America, American Museum of Natural History, Handbook Series No. 3, 1928, p. 94.

### EARLY FARMING PEOPLE IN INDIA AND CHINA

Thousands of years before the opening of the Christian era there were isolated communities of farming people living in the Punjab region of India and in the Wei Valley of China. Those peoples presumably knew nothing of the existence of each other. Each group may have thought they were the only people living on this earth.

*Physical Barriers caused Isolation.* These widely scattered and isolated agricultural communities of the early days embodied the highest cultural and economic advancement of their age. I wish to refer to them as representative of the first stage in the organization of human societies and to emphasize that in each of those communities the chief binding cement was family affection.

In those early days the oceans were impassable, and the great mountain ranges, the deserts and the dense forests were physical barriers that prevented the peoples of the world from mingling with each other. Distance had not been conquered and means of communication were crude.

### THE SPREADING OF POPULATION

Recall now that as the numbers of those who lived on the grass lands and in the various settled communities increased many left their home lands and wandered into the vast unknown territories of Asia, Europe or Africa. Large numbers of people moved westward by land and by sea and established settlements in Greece and on the Italian and Iberian peninsulas. The ancient Mediterranean culture developed. From the Mediterranean shores groups of people ventured northwestward and came to live in parts of Europe bordering the North and Baltic Seas. Other groups of wandering peoples entered Europe from the southeast, crossed slowly over the lands of southern Russia, and came in time into the central and northwestern portions of the continent. As the centuries passed hordes of Mongoloid people from eastern Asia spread westward. Some of those people pressed into European lands and mingled with the white races of the western world.

*A Great Mingling of Peoples in Europe.* From the ethnologists and historians the geographer learns that Europe came gradually to be inhabited by a great agglomeration of people of various ethnic origins, speaking diverse languages, with widely differing customs and conflicting religious ideas. Probably every cultural group of the ancient world of Eurasia and Africa was represented in that great agglomeration before the nation-states of Europe began to take form.

REACTIONS TO NEW ENVIRONMENTS

*The Trial and Error Method was used.* The routes of travel followed by the early wandering peoples were determined by the topographic features in the landscape and by certain waterways. In the location of settlements the peoples were guided by the discovery of good lowland farming areas, good harbors, favorable fishing grounds, or sites affording protection from unfriendly neighbors. Each region presented challenges to the ingenuity and industry of man. His occupations were largely determined by the topography, climate, soils and other natural resources in the newly invaded areas. In the movements northward from the Mediterranean region there was necessarily a slow process of adaptation to differences in climate. Men were forced to provide for longer winter seasons as they moved into higher latitudes, and they were forced to select seeds that would ripen during shorter growing seasons than those in the lands about the margin of the Mediterranean Sea.

Knowledge of the rainfall, of temperature changes, and of the length of the growing season was not available to the early settlers. The science of soils had not been developed although certain "beliefs" about soils were handed down from father to son. There was no way, except through experience, for the settlers to determine where the opportunities for making a living were most favorable. Famines occurred in many sections from lack of rainfall. Crops failed to ripen because of inadequate sunshine, acidic and alkaline soils produced scant returns for labor. The lessons were costly. Throughout the period of wanderings men learned by the trial and error method in the great school of experience.

*Some Influences of Environment Vary.* We recognize that the influence of environmental factors varies with the stage of cultural development. When men were engaged chiefly in hunting the nature of the soil did not interest them directly. The length of the growing season may have determined the coming and going of the game, but the hunters thought very little about the actual dates of the killing frosts.

Not until agriculture was established were people vitally concerned with the nature of the soils, the amount and distribution of rainfall through the seasons, the length of the frost-free period and the amount and distribution of sunshine. Not until long after agriculture had been established in most of the world's chief farm lands, were climatology and a soil science developed.

Little by little, as civilization progressed, the location of copper deposits, then of tin and later of iron became important to men and we recognize corresponding "ages" of copper, bronze and iron. Not until the natural

sciences and technology were developed were the inhabitants of this planet much interested in the great variety of mineral resources which are beneath the soil. Today the economic welfare of the people in each enlightened nation is very materially affected by the distribution of those resources.

## CHANGES IN ENVIRONMENT

Not only have certain environmental factors varied in their influence upon people according to the cultural stages of advancement, but certain elements of environment have themselves changed during the period of human history.

*Changes in Physical Features.* A naval battle was fought off the coast of Belgium where now there are extensive meadows. Thousands of Crusaders set sail in the 12th century from a little port in southern France called St. Gilles, which is now twenty miles inland. Former seaports of Ravenna and Adria, in the vicinity of Venice, are now inland cities separated from salt water by many miles of marshy lands, formed as the Po River has continued its task of filling in the head of the Adriatic Sea. Ocean waves and shore currents have destroyed the sites of villages and ancient fortresses, while at other places by developing spits and hooks they have provided men with safe harbors. Winds, glaciers, volcanoes and ground waters all carry on their work of altering the physical features of the landscape.

In our own southwest the lowering of a stream course made it impracticable to continue the irrigation of lands near an ancient Indian village and forced a little community of people to migrate. Stream piracy in the highlands of Guatemala led to the entrenchment of a river's course, to the lowering of the ground water table, and the robbing of the soil of its moisture. As a result thousands of ancient Mayan people were forced to migrate, cities were abandoned and new sites for urban communities were selected. The Yellow River has presented over and over again terribly dramatic incidents in the lives of Chinese people.

*Changes in Climate.* Just as important, and perhaps more intimately associated with human welfare, are the changes which occur in climate. As the ages pass, periods of increasing and decreasing rainfall occur. In the 12th century large trees suitable for building houses grew in Iceland where today the only trees are a few birches and willows that reach a height of about 10 feet. The economic history of Iceland seems to correspond with periods in the climatic cycles of that island. The desiccation which converted the grassy steppes of the glacial period into deserts presumably caused certain of the early centers of civilization to be located on the banks of rivers. The abandonment of the cliff dwellings in our southwest about

1270 A. D. has been accounted for by Dr. Douglas through the discovery of a period of unusually dry years recorded in the growth rings of the Sequoia trees. A few years of drought will make any section unattractive to man and make it impracticable for a large community of people to remain in such a region. Unfavorable changes in climate may have led the Goths to migrate southward and invade the lands of other European peoples. Severity in climate was probably one of the factors that sent the Vikings off on their adventurous expeditions.

*The Persistent Influences of Environment.* As the great human dramas have continued, certain influences of environment have persisted. The boldest of the landscape features may have been modified, climatic conditions may have changed, but the actors in the great human dramas could not escape from the planet on which they were located and they could not escape the more fundamental and persistent influences which determined where they could enjoy good health and secure the materials needed in the production of tools and weapons used in defense. Men do not conquer nature. They learn to make better and better adjustments to the natural environment.

By the trial and error method the actors have discovered that there are only a few places on the earth where huge national dramas can be successfully enacted. Good farm lands are essential, adequate rainfall is indispensable for a large population, mineral wealth and sources of power must be available, and accessibility to the sea appears to be very important. The more energetic people of the world are now in regions of variable climatic conditions. Three-fourths of the people of the world are now crowded into four comparatively small sections of the land surface in the north temperate zone. Most of the land areas of the great continental platforms are but sparsely populated.

*Many Adjustments and Improvements are Made.* With each advancing stage in culture we find the actors in the great human dramas discovering new facts about the stage settings and to some extent mastering unfavorable conditions about them. They learn to contend with periods of extreme cold or periods of extreme heat, and they discover ways of overcoming to a degree the influence of shortage in rainfall. They have invented such wonderful means of travel that the handicap of distance is almost overcome. They have learned to use copper wires in such a way as to form a veritable nervous system for the entire world, sending messages back and forth between all the most important centers of action. Electric waves now carry the sounds of human voices to the most distant parts of the earth. Gradually the physical barriers that held the people apart have been overcome.

### THE BUILDING OF THE MODERN EUROPEAN NATIONS

Slowly and painfully, and accompanied by bloodshed, various forms of government arose among the peoples in the more crowded sections. A feudal web spread over the map of Europe, principalities, dukedoms and monarchies came into existence. Gradually many distinct national states were established.

*European Empires.* Throughout the Mediaeval and Modern periods of European history powerful monarchs and war lords have tried over and over again to gain control of large sections of land. We recall that the Empire of Charlemagne represented a great and successful movement by the people of France; that Otto the Great later gained control of much of Central Europe and the western portion of the ancient Roman Empire and won "the imperial Crown that Charlemagne had worn." For more than eight centuries his Germanic empire, which later came to be known as the Holy Roman Empire, was the most powerful unit in Europe. Charles the Fifth established, between 1519 and 1556, another great empire, rearranging the controlling governmental set-up for central Europe. He included also under his sway the inhabitants of the Iberian peninsula. Meanwhile a great Turkish empire was building to the east and south of the empires of Otto and Charles. This Ottoman Empire had its palmy days when it included much of the Balkan peninsula and a vast area in the lands of southwestern Asia.

Less than 150 years ago, when Napoleon Bonaparte appeared on the scene, Europe came under the domination of the last and most powerful individual who has held sway over that continent. Nations were again disrupted and a second great French empire was established. It was, however, an empire of short duration soon to be broken up into many parts.

### GEOGRAPHIC FACTORS PLAY AN IMPORTANT PART IN EUROPE

In the process of making national states on the continent of Europe certain environmental factors have been very important. Europe may be thought of as the western peninsula of the continent of Eurasia, but it is itself made up for the most part of smaller peninsulas, and of islands that in some cases have proved to be of great political significance. Islands and peninsulas all tend to cause isolation and thus they have favored the development of distinct nations.

The people who settled in the Iberian peninsula had the advantages of physical isolation but the sub-division of that land by mountain ranges and deep canyons as well as the climate of that peninsula have not favored the development of a strong modern nation. The Italian peninsula, with the lofty Alpine range at the north, is an isolated area suitable for a single

nation. The British Isles provided the advantages of still greater isolation and a strong government became established on those islands as early as nation-states appeared anywhere on the earth. The separation of a mere sixty miles has made for differences between the English and a large number of the Irish people in culture, religion and political sentiments.

The numerous mountain ranges that sub-divide the Balkan peninsula into small physiographic units account in large measure for the various small states that have developed in that part of the continent. The fact that no single strong modern nation has developed on that peninsula is certainly due in part to the unfavorable topography and the meagerness of natural resources. The lofty mountain ranges of Switzerland provide many isolated sections where the settlers have developed a strong feeling of independence and a love of liberty. The lower lands of that country furnish good opportunities for farming, extensive forests and abundant water power encourage manufacturing and the magnificent mountain scenery makes it possible for the inhabitants to conduct a prosperous tourist business. Although the Swiss people include various ethnic groups and use three distinct languages, they have produced a unified nation. They have an abhorrence of war and have contributed to the nations of the world ideals of peace and good will toward other peoples.

The Scandinavian peninsula, with its land connection in the bleak and far northern latitudes, is virtually an island. The mountain barrier through the center of the peninsula persists as a fundamental reason for a somewhat diverse development in culture and interests of the people on the west who look to the ocean for much of their living, and the people to the east who have richer farm lands, more extensive forests and more valuable mineral resources together with the inland sea, to enhance their national development. It is a pleasure to recall that when in 1905 the Norwegian people voted for independence from Sweden the Swedish nation granted that independence peacefully.

The national domain of modern Germany contains two somewhat contrasted physiographic provinces. At the north the lowland plains with their morainic cover are without any pronounced physical barriers that would favor a sub-division of the region, and there are no pronounced physical barriers at the eastern or at the western margins of that lowland plain. South Germany, however, is an upland region with many old, worn down mountain areas. There a network of river valleys has produced numerous small plateaus or uplands which favored the establishment of distinct feudal states.

France is a somewhat isolated national state, but her modern political boundaries do not in all instances conform with lines of physical barriers.

The ocean waters at the west, the Pyrenees at the south, the Alps and Jura Mountains to the east, serve as natural barriers, but the valley of the Rhine offers no particular advantages as a political boundary line. The uplands of the Ardennes are a weak barrier and the lowland plain north of Paris extends into Belgium without any physical break. In that portion of the political boundary, is the zone of weakness where the enemies of France have centered their attacks on several occasions, and notably in the last great war.

### JAPAN AND THE UNITED STATES BECOME WORLD POWERS

The two modern world powers located outside of Europe are the Empire of Japan and the United States of America. The Nipponese have many of the advantages enjoyed by the people of the British Isles. Undoubtedly isolation has favored the unification of these island people and has played an important part in developing an enthusiasm for nationalism. As in the British Isles the limited lowland areas have been made to produce large supplies of food. The shallow waters off the coasts yield a vast amount of fish. The fuels and the mineral wealth of the islands and of the Japanese lands on the continent of Asia supply the raw materials necessary for the development of a great industrial program, and the rain falling on rugged mountain sides provides ample water power.

The North American Colonists, concentrated on the lowlands and hilly lands east of the Appalachian Mountains, were sufficiently isolated during their first 200 years to allow the development of a spirit of unity which helped establish the new nation. During the second period of American history the frontier moved westward until it reached the Pacific Ocean. A century passed during which we were intensely enthusiastic over the development of our own resources. There seemed to be an endless supply of good lands, of mineral fuels, of precious ores, of forests and of water power. A strong feeling of self-sufficiency characterized the age. It was unavoidable that the enthusiasm of the American people should become centered in national development.

Not until about 1890, when we passed on into the third phase in the development of this nation, did we begin to appreciate the importance of our international relationships. Our national domain facing to the east and to the west, and located between the two great centers of civilization on this earth should lead us away from the ideals of provincialism and isolation to those of international relationship and cooperation.

### THE WORK OF MAKING NATIONS MAY NOT YET BE COMPLETED

Four centuries have passed in the evolution of nations and the process appears still incomplete. Japan did not become a great world power until

the opening of the 20th century. The United States of America has been an independent nation for less than 160 years, and its growth to a position of importance among the great world powers has come within the last century. Less than twenty years ago the Austro-Hungarian Empire was dissolved, and in the rearrangement which followed at least five distinct governmental units were established. Some of those appear to be unstable quantities. Today the encroachments of Russia and Japan in Far Eastern areas threaten the integrity of China.

### LOCATION OF THE SIX MOST POWERFUL NATIONS

It is not by chance that the world powers have come to be located in regions where there are considerable areas of lowlands suitable for the production of food crops. It is not an accident that no modern nation has developed in a region of great cold or of great heat. It is not an accident that no single great nation is located in an area of exceedingly heavy rainfall, or of exceedingly light rainfall. The six leading world powers of today, the United States, the British Empire, France, Italy, Germany and Japan, are located in the belt where the climates are variable, where men are energetic and vigorous, and where, because of seasonal changes, they must provide for the future. Moreover, these great nations are located in each instance near the sea. Furthermore, the powerful nations are in localities where rich mineral resources, especially sources of mineral power, have been discovered in the ground beneath the soil. No modern nation can maintain a position of world power without great industrial institutions. It should be clear to all of us that geographic factors have been of very great significance in the location and development of these nations.

### FROM SELF-SUFFICIENCY TO INTER-DEPENDENCE

The first organized human societies, those relatively small agricultural communities that were completely isolated, were perforce entirely self-sufficient. In those communities the binding cement was a family affection or tribal loyalty.

As larger governmental units were established, especially when the nation-states came into existence, a second stage in the organization of human societies was reached. A new form of binding cement was perfected which is often spoken of as "Nationalism," probably the strongest sentimental influence in the world today. We commonly call it patriotism. During the last decade the growth in the spirit of nationalism has led many to revert to the belief in "self-sufficiency." Many people are endeavoring to close their eyes to the facts of economic, social and political interdependence among the nations. Toynbee in his recent work "A Study of History"

states that: "The spirit of nationality is a sour ferment of the new wine of democracy in the old bottles of tribalism."[3]

Certainly geographers with a comprehensive world point of view must recognize that the people on this earth, whether they like it or not, have entered a third era or stage in the organization of human societies. We are faced with very difficult problems which the nation builders did not even dream of. With the speeding up of all forms of travel, transportation and communication we must deal not merely with the organization of tribes or small agricultural communities, not merely with the organization of a nation, or the linking together of the nations of one continent. We are face to face with problems which involve the organization of the entire world. Isolation has become impossible. We are elbow to elbow with the other peoples of this earth. "Interdependence" is unavoidable and "international cooperation" is absolutely essential. Self-sufficiency, as the economic world is organized today, is unattainable. In this third era or stage of development what will be the binding cement?

## ECONOMIC INTERDEPENDENCE

As civilizations have advanced the various groups doing the work of the world have become more and more dependent upon each other. The exceedingly complicated industrial processes of today demand an increasing variety of raw materials. Many of those raw materials can be obtained only in a few widely scattered parts of the world. The people living in the mining, manufacturing, farming and grazing regions in the different countries are interdependent. No one of those groups attempts to be entirely self-sufficient. The people living in the northern hemisphere depend upon those living in portions of the southern hemisphere for large supplies of food and raw materials. The regions north and south of the equator are complementary and the lands within the tropics now produce large quantities of food for those living in cooler regions. International trade is absolutely essential if we are to maintain our modern industries, enjoy the comforts of this age and promote our type of civilization.

## ISOLATION IMPOSSIBLE TODAY

The United States of America is probably the most nearly self-sufficient of the larger nations, but if we adopt "self-sufficiency" as a motto, many adjustments must be made. It will be necessary to change our diet, for we shall be without many of the foods which we now enjoy. We must modify our articles of clothing, for we shall be entirely without silk and, until new adjustments are made, without sufficient wool and leather. We shall be

[3] Tonybee, Arnold J., A Study of History, Vol. I, p. 9.

entirely without rubber. We are short of many essential elements needed in the production of modern steel. Today we import over forty such elements and they are used in the production of one or another variety of steel manufactured in this country. We are naturally interested in all of the markets in the world where we may sell the surplus products from our farms and from our factories. We are naturally equally interested in all of those parts of the world from which we must import raw materials or manufactured articles. There are but few other inhabited places on this planet. Isolation for us is impracticable if not absolutely impossible.

England was the first country to realize her dependence upon the rest of the world. Today the British Empire occupies more than one-quarter of the habitable land area of the globe, and its population includes nearly one-quarter of mankind. It is by far the largest and most populous of the sovereign states. It is preeminently a world state and no people recognize more clearly than do the British their dependence upon the freedom of the seas at all times and of free intercourse between the various peoples of the world.

Some Frenchmen claim that their nation is self-sufficient and the boast is often made by citizens of that nation that they can be independent from the rest of the world, but I quote from M. Francis Delaisi,[4] who describes, in the following words, a day in the life of a French middle-class business man:

"M. Durand begins his day by washing himself with soap made from Congo nuts, and drying himself with a towel made in Lancashire from cotton grown in Texas. He puts on a shirt and collar of Russian linen, a suit made of wool from Australia or the Cape, a silk tie woven from Japanese cocoons, and shoes whose leather came from an Argentine ox, and has been tanned with German chemicals. In his dining-room, which is adorned with a Dutch sideboard made of wood from Hungarian forests, the table is furnished with spoons and forks of plated metal, made of Rio Tinto copper, tin from the Straits and Australian silver. His fresh loaf is of wheat from the Beauce, Rumania or Canada, according to the season; he has a slice of chilled lamb from the Argentine, with tinned peas from California; his sweet includes English jam made of French fruit and Cuban sugar, and his excellent coffee comes from Brazil. He goes to his office in an American car; and after noting the quotations of the Liverpool, London, Amsterdam and Yokahoma exchanges, he dictates his correspondence, which is taken down on an English typewriter, and signed with an American foun-

[4] Delaisi, Francis, Political Myths and Economic Realities, Viking Press, New York, 1927, pp. 138–140.

tain-pen. In his factory fancy goods for Brazilian customers are being manufactured of materials of many origins, by machinery made in Lorraine on a German patent, and fed with English coal; he gives instructions that they are to be sent to Rio by the first German boat sailing from Cherbourg. He then goes to his bank, to pay in a cheque in guilders from a Dutch client, and to buy sterling to pay for English goods. After a profitable day, he proposes to spend the evening at a show with his wife. She dons her blue fox fur from Siberia,and her diamonds from the Cape; they dine in an Italian restaurant, go to see the Russian ballet, and after supper at a Caucasian cabaret to the music of a negro jazz band, they return home. As M. Durand falls asleep under his quilt of Norwegian duck-feathers, he thinks with pride of the greatness of France, entirely self-supporting and able to snap her fingers at the whole world!"

### BETTER ADJUSTMENTS TO ENVIRONMENT NECESSARY

Now that all the lands on this planet that are worth having have been appropriated, and all the better lands are densely populated, with some parts so crowded that it is difficult to find parking space, greater refinements in the adjustments which men make to the geographic conditions in their several environments are becoming more and more necessary. The opportunity for modern geographers is at hand. Frontier days have passed in most of the great nations and the care of ever-increasing populations must come about through wiser planning and through well organized cooperation.

Geographers should become more familiar with their great out-of-door laboratory. Research projects must be carried out in various parts of the world and repeated periodically in order that we may have sufficient up to the minute information. Such studies as those of marginal zones carried on under the direction of a former president of this association are certain to be of national significance. The recent field work in the Brazilian coffee producing district by one of the younger members of this organization should serve effectively in guiding those who are interested in expanding or restricting that industry. The persistent attack on the problem of soil erosion by one of our members has finally commanded attention and support. The investigations in Java of the unproductive lands and their potentialities are additional examples of geographical research that are of immediate practical value. There is certainly a problem associated with an unproductive area of land within 50 miles of the home of each one of us.

The construction of settling basins in the broad lowlands of the Mississippi valley below Cairo would make possible the reclaiming of many millions of tons of invaluable soils each year, and the gradual production of one of the richest farm lands in the world. There the rainfall is ade-

quate for agriculture and the length of the growing season varies from 200 to 250 days. Fully twenty million people could become self-supporting on that land. Why not abandon a policy of spending millions of dollars each year to fight that great river, forcing it to carry soil materials to the Gulf of Mexico, and with the cooperation of engineers guide and assist the stream to do its normal work of aggrading its natural flood plain?

No one should attempt to counsel with the cotton producing farmers of this country until he has an adequate knowledge of the present and probable future development of that same industry in China, India, Russia, Egypt and Brazil. Our cotton producers are, or will be, face to face in the world markets with representatives from those regions.

I doubt whether there is any virgin field for scientific research that offers greater possibilities than the ocean of atmosphere in which we live. Our knowledge of the atmosphere is in its infancy. There should be established in this country an Institute for Aerial Research. A greater knowledge of the atmosphere will throw tremendous light upon the problem of aeronautics, radio transmission, terrestrial magnetism, weather and climate. Long-range weather forecasting awaits a more thorough knowledge of the upper air, and of accurate knowledge of the temperatures of surface waters of the sea, and of the air over the sea. Reliable weekly and monthly weather forecasts would prove to be of immense value. Reliable seasonal weather forecasts would rank with the most valuable contributions that any science has yet made to the economic welfare of mankind. Suppose scientists could have predicted the years of drought which have recently brought despair to the middle western section of our own country. To avoid the evil effects of one such disaster would more than repay all that such an Institute would cost during a century of progress.

Geographers should become expert guides in directing the more intensive use of the lands and of the seas. Many in our profession should become land economic surveyors and be available for local communities, cities, states, or the nation in carrying out new plans for the utilization of lands and of other natural resources. Others in our professional group should become equally proficient in locating specialized industries and in guiding the promotion of domestic and foreign trade. A great field of public service awaits those who become proficient in the political geography of the world. They should make intensive field studies in cooperation with historians and economists of each of the danger zones. A better understanding of the causes that may precipitate trouble will go far toward removing the danger of that trouble.

The number and variety of opportunities for geographical research which should prove to be of national or international significance justifies a professional group many times our present enrollment and a subsidy com-

parable to those enjoyed today by several of the natural sciences. Adequate plans for the improvement of conditions for human beings cannot be made without a systematic knowledge of modern geography.

But to geographers there is in addition a still greater opportunity of service.

### A REAL KNOWLEDGE OF GEOGRAPHY SHOULD MEAN GOOD WILL AMONG NATIONS

Over and above the importance of economic welfare stands the cultural and spiritual welfare of the nations and of good will among men. Economic considerations have had far too great an influence in determining international relationships, and we know they have forced, through conscription, millions of young men to sacrifice their lives. To geographers has been assigned the task and the remarkable opportunity of introducing the people of one nation to the people living in the other nations of the world. Much depends upon that introduction and upon intelligent understanding of other people's environmental problems. Have geographers risen to the occasion and dispelled ignorance of the social and political conditions in the several nations of this world? Our supreme responsibility today is to overcome the ignorance among our own people of the other peoples of the world and to remove all vestiges of hatred. We must develop an intelligent and sympathetic understanding for other peoples. Too many have no sense of the wonderful world in which we live, or of the wonderful people who inhabit other parts of the world.

### PEACE CANNOT DWELL WITH IGNORANCE

Ignorance breeds suspicion. International understanding cannot be built on fear, or suspicion, or hatred. The damnable practices of war must be stamped out and placed in our historic background along with the torture chamber, the guillotine and private duelling.

It is in the field of international cooperation that there has been terrifying retrogression during the last decade. Why do so many of the international conferences fail? Why is the League of Nations unable to carry out its purpose? Why cannot the world court function more effectively? Why do the nations of the world stifle themselves by deliberately planning economic warfare? Why is there such keen competition in armament?

No one can visit the countries of the world without being impressed with the universal demand of the masses of the people for peace. They have always wanted peace. Today that is the cry of the world, and it echoes from the hillsides, the mountain slopes, the forests and the meadows; wherever people are at work, wherever they have their homes. The youth of today are organizing in most of the countries of the world, spurred on

by resentment toward a policy which may drag them on to battleships or into the trenches in foreign lands in order to protect or enhance the private interests of a few individuals. Many of the young people hold that unless their home lands are invaded they should not be called upon to take up arms and fight. One cannot mingle with the people in the various countries without appreciating that there is scarcely an individual, unless he is selfishly profiting by the maintenance of large armies and large navies, who approves of the antiquated system of settling disputes by going to war. Mr. A. A. Milne has demonstrated in a most interesting and forceful manner in his most recent volume that peace is possible with honor.[5]

### A NEW BINDING CEMENT

We must free our patriotism from the restrictions of narrow nationalism and provincialism and find a new cement. What possible contribution can be made today or tomorrow which is of greater interest to us and of greater significance in the progress of mankind than the establishment of peace, justice and cooperation among the people living on this planet? Does one's friendship for the peoples of other nations necessitate the diminution of patriotic feeling toward one's own country or reduce in the least one's value to his country? There is really no great difference between wise nationalism and wise internationalism. Wise nationalism will help to build up a structure which will support movements that give stability to treaties, integrity to international relationships and establish harmony and peace among the nations of the world. No subject in the curriculum of our educational institutions lends itself so completely to this end as modern geography. No other subject deals with so many of the basic facts which should make for our better understanding of other peoples.

Can we not in this country through ideals which guide us in our more systematic and formal educational work, and in the development of adult public opinion throughout this nation, gain a position of leadership in the establishment of a more sympathetic appreciation of world problems and in a nobility of ideals toward other peoples, and thus help to turn the tide toward the reestablishment of rational international relationships? Is there not a patroitism that can be based on something other than a pride in military power? Is there not a basis for evaluating nations other than strength in battle? Can we not rise out of old dreams to new and greater ones in which a world wide *enthusiasm for peace* becomes a binding cement making war absolutely impossible and thus relieving the nations of their most unnecessary and oppressive of all burdens?

[5] Milne, A. A., Peace with Honour.

*Clark University,*
*December, 1934.*

# Are We Free To Coin New Terms?[1]

J. RUSSELL SMITH

Speech has various objectives. I recall a one-time colleague, a German-born mathematician—a great or certainly a near great mathematician. One morning he walked into the office of a friend of his in the economics department. He was in a high state of elation.

"Joe," said he to the economist. "Don't you know, I vent out last night to So-and-So and read a paper before de Mattymatical Society, and, don't you know, Joe, dere vasn't a man dere dat knew vot I was ta-a-alken about!"

Apparently he got joy out of *not* being understood. By creating confusion in other minds he gave himself a satisfactory sense of superiority.

But let us suppose that our object is to be understood. As geographers, we have an advancing subject in which new concepts are constantly being developed, and every new concept creates the desire for exact expression, which often makes us desire or coin a new term. The alternative may be two or more old words placed in new relationships.

We have witnessed the creation and widespread acceptance of such words as telegraph, telephone, automobile. They are accepted in all walks of life and in all levels of education. Shall we make some similar brand new term every time we get a new idea in geography?

Before coining, note this difference. *Telegraph, telephone,* and *automobile* are extremely tangible things. They force themselves upon our attention. They run up and down the road or come into our house, or resound through its rooms. If every new thing in geography had such advantages of concrete visibility and daily common utility we could call them macrocorum, microcorum, mesocorum, cenocorum, triacorum, quaternacorum, and experience little difficulty. But the fact is that most of our new terms refer to such things as an aspect of land, or the definition of an area of land, or the relationships of a group of people. These are abstract things. They cannot be seen as is an automobile, or heard as is the radio. They require thought. They are *ideas,* not *objects,* and they have no wide daily usage in the market place. The attitude of the market place toward long

[1]EDITOR'S NOTE: In a sense this paper, presented at the Philadelphia Meeting of the Association, carries on the discussion of the previous year at Evanston, published in the June, 1934, *Annals* under the general heading "Conventionalizing Geographic Investigation and Presentation." See especially James, Preston E.: "The Terminology of Regional Description," in that number, *vol. XXIV, pp. 78–92.*

words is well illustrated by the use of "phone" for "telephone" and "wire" for "telegram" or "telegraph."

What shall we do with a new concept, or an old one that we wish to sharpen and revivify? Let us consider an example, a concept not exactly new—an old one, indeed, but one which we wish to use more than it has been used and to make a part of widespread thought processes. It is the original environment unmodified by man. One of our enterprising members conceived the idea that it would be good to use the old word "fundament" to convey this concept.

Let us suppose that the college freshman in the coming golden age of learning, when all freshmen study geography, sees this word in his text, is puzzled by it, and, obedient to the admonitions of his professor, hastens to the dictionary to find its meaning. He reads, in the Shorter Oxford Dictionary: "**1.** foundation. **2.** the lower part of the body on which one sits: the buttocks; also the anus." Our freshman is likely to inquire, "What is this geography, anyhow?"

There are two ways of making a new term. One, as in the case of "fundament," above mentioned, is to take an old word and put into it, or try to put into it, a new meaning. The Christian Scientists have succeeded after a fashion with this, but I beg that geographers shall not try to follow their example. It is certainly an excellent method in producing a half century of confusion. It will be long before the dictionaries follow us so that the student can find the word in this all important reference book, and we scarcely wish to publish a special lexicon in each of our books. If a new word is to be made it should, if possible, be one that can have only one meaning. It should soothe the ear, slip easily into the mind, and if possible define itself or almost define itself. Such a word is Mr. Whittlesey's "occupance."

The specialists in different sciences differ greatly in the freedom with which they can successfully coin new terms. In this respect the geographers differ profoundly from the chemists and the engineers. Chemists talk to chemists. They write for chemists. The net final result of chemistry is *chemicals*. When you and I buy Listerine, vaseline, or gasoline we do not care how many hundred jawbreakers were used by the chemists who taught the men who finally made the commercial goods that we wanted.

Similarly, the engineer with his great battery of technical terms talks to *engineers*, but his product, his point of contact with the world, is the *machinery* and the *structures* which he creates. The chemists and the engineers live and talk in a little world apart, using a special language of their own, and we don't care what they call things, because they are not our things and we never talk about them. I confess that I envy them their free-

dom to create new words with little difficulty about their acceptance of their meaning.

We must remember that the object of language is to be understood. The geographers may be said to have a double relationship to the world. In one aspect they may be like the engineers, using a special language for a small special group. Perhaps they need a kind of house language to be used in the building up of the science, for use among geographers only. Someone goes out and makes a minute study of a small area, or industry, or local situation. He brings the results to this meeting, or to the *Annals,* or to the *Geographical Review,* or perhaps to the *Journal of Geography* or to *Economic Geography,* or possibly to a governmental bureau for the guidance of that bureau. He may use any kind of language which will be understood by the readers of his report, but if he is too ferociously technical the readers will be limited to a small group of the technically trained.

My major point is that if the geographers need and develop such a language for geographers it can be useful in but a minor part of our service to humanity.

The chemist produces chemicals, the engineer produces machines and structures, but the chief function of geographers is education—the education of people who are not geographers and never will be geographers. This places us in an entirely different position from that occupied by chemists and engineers. You can get some appreciation of my point that the object of geography is chiefly education by listing the persons who are employed with geography. Certainly there are a hundred employed as teachers of geography, or doing work that is dependent upon them, to one who earns his living through geography in any other way.

In our schools geography follows promptly upon the heels of reading, writing, and arithmetic. We may without exaggeration say that reading, writing, and arithmetic are mental tools. After the pupil has acquired these three tools the next thing we give him is geography. Unfortunately the subject has as yet barely touched its educational possibilities. Geography needs to grow greatly in the part it plays in education. For the want of it our history books and our history teaching are often dramatic episodes occurring in the air—a play without a stage. The economists and the sociologists, like the historians, are often blundering along with gross misapplications of their efforts because they lack even so much geographical understanding as could be acquired by the careful study of the general introductory courses in geography in one of many American colleges today.

It is difficult to believe that legislators who knew so much geography as could be acquired in this one college course would be guilty of pushing their nations into the present wave of economic nationalism which seems to be

running around the world like a kind of insanity, which indeed it is, in part.

Perhaps we need a technical language within the family circle of geographers, somewhat after the fashion of many Oriental languages which have a high class and a low class vocabulary—the language of the court and the language of the street, with different vocabularies for the elements of daily life and thought. We *may* need such a language, but we *must* connect with the nongeographers, and for that objective let the word coiners take double care.

As an example of geographic statement and geographic vocabulary I call your attention to a recent book by Isaiah Bowman, "Geography in Relation to the Social Sciences." In his case we have a man who may be called our leading geographer, if the title shall be applied upon the basis of positions now occupied or positions that have been occupied. Few if any of us have had so many opportunities to make geography of service to the state and to other sciences. Bowman has done good field work, and he knows a lot of technical words. He has a wide familiarity with current literature. But when he writes this book, "Geography in Relation to the Social Sciences," he is talking primarily to nongeographers, *the group through whom geography must do its greatest work*. I have recently read the book from the first word to the last, carefully. I do not recall once having fled to my dictionary or having seen any word that would not be understood by an historian, an economist, a college freshman, or even perhaps by a member of a state legislature.

In somewhat similar vein I recall a lecture given not more than three years ago by the late lamented William Morris Davis, who may without much exaggeration be called one of the fathers of physiography, and the creator of some new terms. This lecture was on the geologic and physiographic history of the Grand Canyon. It was given in the geology department of Columbia University, but it was a public lecture to which students of other faculties were invited. I sat through it carefully, and I have no memory of words that would have puzzled the college freshman who had entered from a young ladies' finishing school.

In his relation to the public—that is to say, in most of his activity aside from research—the geographer is in the position of the editor of *Science News Letter*. There you may see each week news from half a dozen scientific fields—fields that bristle with technical terms directly derived from the Latin and the Greek—yet the *findings* from these sciences are passed on to us in simple English such as a freshman can understand.

The subject Geography is now about half way through a half century of handicap because of a simple fact of nomenclature. Almost every worker in geography suffers at some time or other because geography is an old word with a new meaning.

It is thirty years ago this Christmas since William Morris Davis called together a group of his colleagues in this city at the time of the meeting of the American Association for the Advancement of Science, and founded the Association of American Geographers. In his address to this group he gave the definition of geography as being the relationship between the earth and the organisms upon it. I think it is fair to call this the date of the launching of that definition, although it was some months before it was published. It was unfortunate that this new meaning had to be put into an old word. It is not yet clear in.

It is a slow process for such a definition to get wide acceptance. Launched thirty years ago, it gradually worked its way into the minds of textbook writers, and then gradually it caused the rearrangement of textbooks and got into the schools. But the number of persons in America over thirty years of age who have been taught that kind of geography in their school days is small. Unfortunately, most of the people who manage the schools and governments of the United States got their geography in the days before Davis. Mention geography to one of these, and he thinks of the rigamaroles that he learned in geography class in elementary school —things with a value not unlike that of Eeny, meeny, miny, mo! That is why in New York City they give high-school geography classes to the music teacher and the teacher of penmanship. Owing to this prejudice against geography, the subject is under a distinct handicap in getting hearing or opportunities to be of service.

I asked one geographer, recently gone to Washington, what he was doing, and he replied that he was trying to get some geography into a certain work there, but that he did not dare call it geography.

Yesterday in this meeting, Mr. Frey, a well trained geographer, now in government employ, said that he passed himself off as a "regional economist."

The Mississippi Valley Committee has Professor H. H. Barrows doing excellent geographic work. How did they get him? They were seeking a person expert in the conservation of natural resources, and happened to ask a geographer as to who would be a good man. The geographer strongly recommended Barrows, and he was given a great opportunity, but he was sought as an expert in *conservation*, not as a geographer. If he had been recommended as a geographer it might not have been possible to convince people who knew no geography how important it was to have that kind of man.

In the selection of their terms geographers have a distinct handicap, because their employers in government and in education are so often ignorant of what geography is, or have a prejudice against it because of their youthful experiences.

Now consider the case of Mr. Hudson, geographer to the Tennessee Valley Authority. He has a position of vital importance to the future of geography. If the Tennessee Valley Authority makes good it will be widely copied, and one element of its success will be the proper adjustment of its work to the geographic background. Mr. Hudson must see and sell geography as a vital element in economic and social reconstruction to be carried out by the business men of the Tennessee Valley. If he and the TVA succeed it will be a great opening wedge for the much wider employment of geographers in the government services, if we can produce the right kind of men. In a sense, Mr. Hudson carries many futures in his hand.

Mr. Hudson, guard well thy words. Think thrice before airing thy Greek and Latin. If thou must have relief for a pent up technical classicism, come here[2] and bury us with it. We will understand (perhaps), or at least pretend that we do. In Tennessee, talk English so far as possible, for the next decade at least.

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[2] This paper was read at the December meeting of the Association of American Geographers.

*Columbia University,*
*December, 1934.*

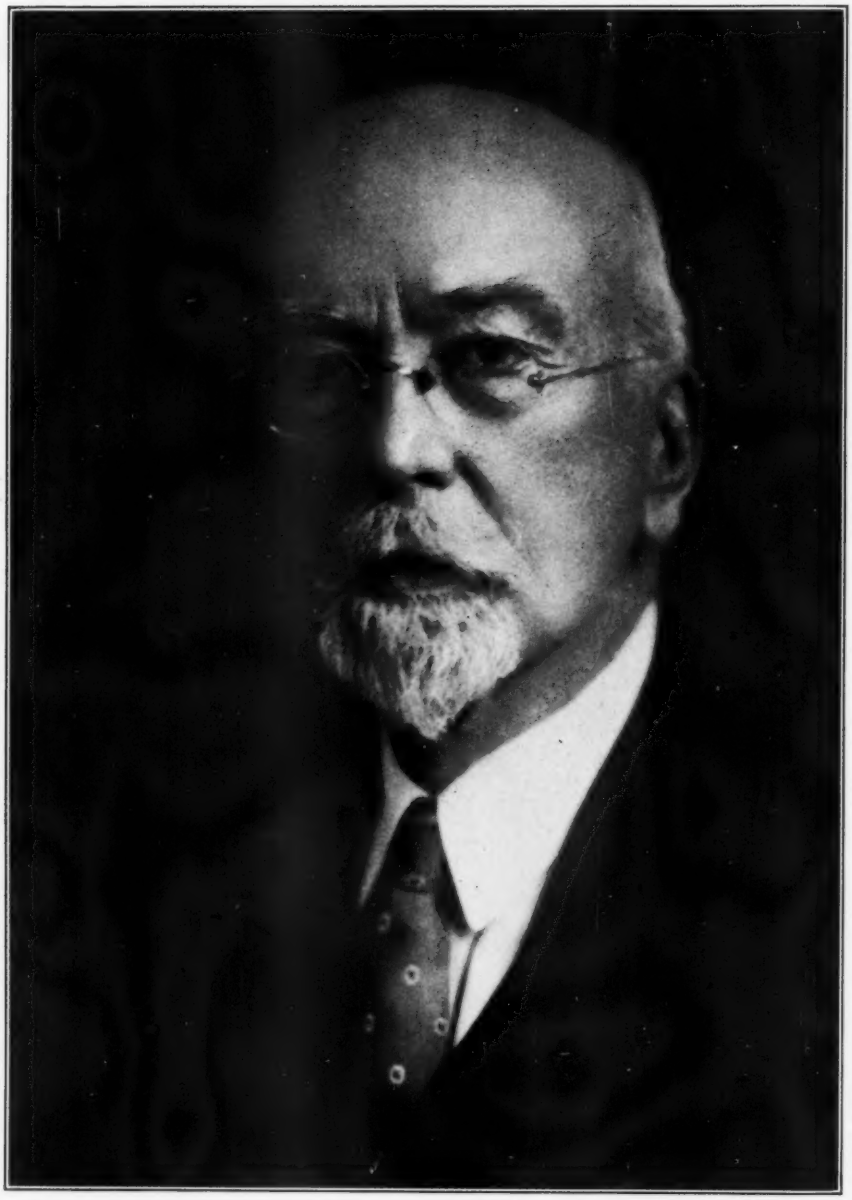

Photo by courtesy of the *Scientific Monthly.*

WILLIAM MORRIS DAVIS—1850–1934

# William Morris Davis—Leader in Geomorphology and Geography

KIRK BRYAN

In giving some account of, and a tribute to William Morris Davis, in a meeting of this Association, we are all aware that but for his influence this organization would not have been formed. His ideas have for so long held a dominant position, his clear and incisive comments have for so long been a feature of these meetings that it seems a little unreal to be presenting a memorial to him. In speaking of him it is difficult to realize that he is no longer with us. No one of us can give a wholly unemotional résumé of his life nor a just estimate of his eminence in science. A proper perspective requires time. All of us have reached manhood during the period in which he has been the dominant force in Geomorphology and the leading advocate of Geography. Receiving directly from him or from his disciples a large part of our early inspiration and technique we have looked to him not only as a mentor and an elder, but as a continually active contributor. This attitude is due to Davis's unusually long period of activity—a matter of sixty-four years. We look back on two generations of labor and thought embodied in a single man.

## HIS CAREER IN OUTLINE

Born of Quaker stock in Philadelphia in 1850 he died in Pasadena, California, on February 5, 1934, seven days short of his eighty-fourth birthday. Graduating from Harvard in 1869, he took a year's graduate work and received the M.E. degree in 1870. Then followed three years as assistant in the Argentine Meteorological Observatory at Córdoba. He then returned to Harvard and was assistant to and instructor under Shaler in the Department of Geology until 1885. He was successively assistant professor and professor of Physical Geography until 1899 when he became Sturgis Hooper Professor of Geology. In 1909 he was visiting professor in the University of Berlin and in 1912 at the Sorbonne. In 1912 he retired from Harvard after thirty-five years tenure but his later activities included service at the Universities of Oregon, California and Arizona, at Stanford and Columbia Universities and California Institute of Technology. This is an almost unparalleled teaching service. Not only did he influence Harvard where he trained a succession of brilliant students, but he extended his teaching to Europe. Later his personal instruction extended to many

institutions on the Pacific Coast where he was welcomed for his fame and for his ability to inspire in students and in faculty a love of science.

Many honors came to Davis. He was an honorary doctor of the Universities of Cape Town, Melbourne, Griefswald and Christiania. He was a Chevalier de la Légion d'Honneur and received medals from the American Geographical Society, Harvard Travelers Club, Chicago Geographical Society, Philadelphia Geographical Society, Philadelphia Academy of Natural Sciences, Royal Geographical Society, Swedish Geographical Society, Hungarian Geographical Society, and lastly the Penrose medal of the Geological Society of America. He was a member of the National Academy of Sciences, American Philosophical Society and American Academy of Arts and Sciences. The list of societies of which he was an honorary or corresponding member includes the principal academies, and all the important geological and geographical societies of the world. He was president of the Geological Society of America, Harvard Travelers Club, and three times president of our Association—in 1904, 1905 and 1909.

So long and so honorable a career defies precise analysis. Davis's work may be divided into sections which correspond more or less closely to certain periods. There is, however, a continuous thread which runs throughout the fabric. He was always an analyst and a generalizer. His mental habit was continuous and gives to his work in diverse fields a similarity.

### WORK IN METEOROLOGY

Davis's appointment to the meteorological service of Argentina led directly to his teaching meteorology and to the publication of forty-two papers on this subject. In 1894 he published his famous and much-used textbook. Meteorology had been almost wholly in the hands of specialists who had recently made great advances. All these he analyzed and explained with such clarity that the basic principles could be taught to young students. Here his talent for bringing to a focus a diffuse and hitherto unorganized subject showed with a brilliance that cast a beam into the future.

### WORK IN GEOLOGY

During this period Davis served with Pumpelly in the Northern Pacific Railway Survey and also was much influenced by Shaler. Thus he began a productive career in Geology in which his first paper was published in 1880. Few realize that he published not less than 29 papers which are strictly geological and not related directly to Geomorphology and Glacial Geology. These geologic studies covered a wide range but the larger number relate to the Triassic Basin of Connecticut. These studies under the auspices of the United States Geological Survey were brought to comple-

tion in a great memoir published in the *18th Annual Report* in the year 1898. The most important other study related to the so-called "lake beds" of the Western Tertiary which he showed by a conclusive analysis are largely flood plain and fan deposits.

Shaler's influence led him to co-operate in a book on *Illustrations of the Earth's Surface* published in 1881. Here he discovered and never afterwards lost his interest in the vivid presentation of facts to the unlearned. Again and again he returned to the effort to illustrate and explain the features of the earth. In public lectures and papers published in every available medium he used diagrams and explanatory description. He also devoted much time and energy to geologic models. Illustration was perfected by him to a degree attained by no other single worker in the field. The great organized groups, such as the United States Geological Survey, have produced many examples of elaborate and striking illustrations. Davis, however, was a lone worker and perfected the pen-and-ink drawing suitable for inexpensive publication. These drawings took the form of perspective landscapes and block diagrams. It is possible to trace the influence of the great and versatile artist-scientist W. H. Holmes in the detail of pen strokes used by Davis, yet Davis attained by self-training a simplicity of representation of land form that will ever remain a model. His drawings are lucid and persuasive. For most of us they form the basis for our mental images of glaciated topography, of youth, old age and other geomorphic types which words alone could never have conveyed. The sureness of his pen stroke, the delicacy of his sense of proportion remained with him until the end. The pen drawings of his last papers are as fine as those of his early and classic papers. At the age of eighty-four his hand was as steady, his eye as keen as in his youth!

## WORK IN GEOMORPHOLOGY

Davis's interest in and concentration on geomorphic problems appears to have begun with his experience in Montana in the 70's and been developed through the influence of Shaler. Papers on lake forms and glacial erosion in 1882, gorges, waterfalls and drumlins in 1884 and several abstracts precede the famous paper of 1889: "The Rivers and Valleys of Pennsylvania." This great essay was followed in 1890 by "The Rivers of Northern New Jersey, with Notes on the Classification of Rivers in General." Although these papers were preceded by abstracts of addresses as early as 1883 these dates mark the beginning of Davis's great career as the founder of Physiography or Geomorphology. In this field he was the organizer, the definer, the analyst and critic. For him the argument by which results may be attained was the important thing. Thus he perfected

presentation by giving first the deductive analysis, summing up the field facts and then, with verbal description, presenting a lucid explanation of the complicated origin of the land form. His interest covered the whole field: glacial phenomena, wave work and shores, rivers, cliffs, hills, valleys and lakes. On all of these he wrote papers based on field studies. Similarly he wrote extensively on the physiography of various parts of the world outside of the United States. Here he introduced his methods and his philosophy through the interpretation of local features.

These smaller projects fade from memory when his greatest work is considered. This was the formulation and elaboration of the doctrine of the Cycle of Erosion. With his keen historical sense he has, on numerous occasions, traced the development of ideas in regard to the reduction of land masses by the processes of subaerial weathering and removal of material. He accorded to each predecessor his share of achievement. No one, however, will deny to Davis the prime credit of integrating these ideas into a whole, of furnishing a flexible terminology and of clarifying the philosophic implications of the doctrine. The progress of development of land forms from initial forms through the metaphorical stages of Youth, Maturity and Old Age to the almost plain or peneplain that approximates base level; rejuvenation by relative uplift, inheritance of forms, exhumation of buried surfaces; all the vivid terms of physical process made dramatic by his genius, are now the common intellectual property of us all. The effect on the science of Geology has been enormous. The ideas have penetrated into all branches of the subject. Modern studies of sedimentary rocks rest on interpretation of the geomorphology of the time and lead to refinements of Paleogeography. A leading mineralogist explains a unique deposit of minerals by the interposition of a cycle of erosion, peneplanation and deep weathering between the original deposition of sulphide ores and a later period of high temperature metamorphism. The search for ore deposits of certain types and predictions of their occurrence are based on physiographic argument. So pervading in geology is this influence that it can almost be said that all geologists are now geomorphologists. Geomorphology has become merely one of many working methods in geologic investigation.

Only in Germany has there persisted opposition to the Davis philosophy. Certain die-hards have never admitted the validity of the argument for the Cycle of Erosion or the acceptability of the terms. More recently the analysis of W. Penck has found favor and has been considered a complete substitute for the Cycle of Erosion. As Davis has himself discussed and refuted these attacks quite recently (1932) I forbear from discussing them. It is a situation full of irony that only in the German did he fully

set forth his doctrine. The "Erklärende Bescreibung der Landformen" has no equivalent in English, yet in Germany he has been persistently misunderstood. Also Davis always insisted that Geomorphology is geographical and non-geologic but in Germany alone was this admonition heeded. As Douglas Johnson has clearly brought out, the discipline of Geomorphology is essentially geologic and the errors of the Germans have arisen by a too literal attempt to carry out Davis's advice. Many of them have pursued the subject of land forms without an adequate geologic background.

Davis developed his "Cycle" with the postulate that the forces of erosion operate in a humid temperate climate—his "normal" climate. Many years later he considered also the geomorphic development of arid regions, modifying and adapting the terminology and bringing the apparently diverse land forms into harmony. He never seriously considered the modifications of process that may be brought about by the nuances of climate. After all there are many types of climate. Weathering, stream action and all the other processes of destruction of rock and carrying away of débris are affected by minor differences in climate. These modifications of the "Cycle of Erosion" will form one of the chief objectives for future workers. Similarly, Davis idealized rivers. According to his viewpoint rivers differ mainly in size, they all, in varying degrees cut, downward and also laterally, and transport débris or deposit it. Now rivers are highly individual; so much so as to justify more or less the popular tendency to personify them, as "Old Man River," "Big Muddy" and other characteristic terms suggest. There is a rich and fruitful mass of data on the run-off, floods, silt content, migration and other features of rivers as yet untouched by geomorphologists. The terminology of rivers as now used was largely inspired by Davis and his earlier contemporaries. It is wholly qualitative and needs integration with the large masses of quantitative data now available.

In many another phase of Geomorphology we need to pass from the qualitative to the quantitative. Thus there rests on those who consider themselves geomorphologists a responsibility to carry forward the work so ably begun by Davis. His major concern was with the great generalizations. These principles have been absorbed into the general philosophy of geology. For the future there remains largely the work of refinement of the principles and their quantitative application.

In regard, however, to descriptive Geomorphology or, as Davis would say Geomorphography, the future is not so clear. The description of the land appears to be a limited field. When all the earth has been described the end will have been reached. Yet Davis held that this was the chief aim of his methods and of his doctrine. Remembering that Davis was primarily

a philosopher and a teacher his position should be re-examined. He held that the description of the land was prerequisite to the understanding of life for which the land formed the stage. No one can appreciate or remember a merely empiric description. Therefore a genetic or explanatory description is necessary. Consequently the production of such a description is the great achievement of the physical geographer and the aim of geomorphic work. In the past twenty years the greatest achievements have been made along these lines. The Committee on Physiographic Provinces of this Association under the leadership of Professor Fenneman has contributed largely to this end. The principal larger divisions of this country have been determined. Many minor divisions have also been defined. Even if refinements continue to be made, the big work is accomplished. But is it possible to be wholly satisfied with the "explanatory description"? Are either geomorphologists or general geographers satisfied? Are these descriptions lacking because the origin of the land forms is inadequately known or because the available terminology is too conventionalized and too vague?

These questions are too far-reaching to be adequately discussed here. It can be expected, however, that future detailed studies will improve our knowledge of the origin of land forms. Some of the ineptitudes of description lie in the inaccuracies of existing knowledge of the origin of the forms and in overgeneralization of complicated geomorphic development. However, the terminology of Davis, metaphorical and picturesque in his hands, often loses its lustre in the hands of lesser men; like the gilt ornaments which adorn a military hero, but merely give a false lustre to a hotel doorman. Either the geomorphologist who attempts explanatory description of land forms must rise to the heights of Davis or some modification of the terminology less subject to the tarnish of commonplace use must arise.

If the difficulties of description seem large and the field limited, the use of geomorphic methods in deciphering the records of the past is unlimited. Deposits of Late Tertiary and Quaternary date are comparatively thin or wanting in many areas. The only record of events is to be found in uplifted and dissected erosion surfaces and in the pattern of stream courses. Here is one of the great fields of geomorphic research—so ably explored and so admirably signposted by Davis.

Great as Davis's contributions to Geology have been he always considered himself a geographer. Under the broad views of Agassiz and Shaler all Natural History was interrelated. Davis was a teacher of Physical Geography and an active worker in both Meteorology and Geology. As part of the necessities of his position and by the logic of his developing interests he early undertook the reform of Physical Geography as to content

and methods of teaching. He found Physical Geography a hodge-podge of more or less related matters, taught empirically, and supremely dull by reason of long lists of names and elevations, of description piled on description. Davis's attitude toward this subject was more affected by his geological than his meteorological background. He viewed Physical Geography geologically or geomorphically. The surface features of the earth had a history and attained their present form by the interaction of forces within and without the earth. Following this line of thought all the material of Physical Geography could be relegated to three classes: (1) prime factors: such as the size and shape of the earth, its position in the heavens, etc.; (2) climate and processes: such as control or bring about the decay and destruction of the land; (3) land forms: pristine and initial as when recently produced by uplift or sedimentation, or sequential when produced by the secondary destruction of an initial form. Now from the geologic viewpoint, land forms, although an end product, are the most important of these three categories and this viewpoint Davis took. In his *Physical Geography* published in 1896 all the other data of Physical Geography are subordinate to the description and classification of land forms or to what can be properly called Geomorphology although Davis indignantly rejected this term.

His position was gradually expanded. Beginning with the thesis that a genetic study of land forms permitted an explanatory description he rightly held that only such a description could be remembered. Thus he justified the teaching of geomorphic Geography. The title that he used was Physiography, a term much and sometimes unjustly criticized. He advocated Physiography as the essential of geographic teaching. In this he was indefatigable and he brought about, in schools and in colleges, an almost complete change in trend. From this position it was easy to hold that the main object of geomorphic study is the description of land form. Here he split with most of his geologic colleagues who continued to regard his work as geologic and to cherish him as a geologist. To pursue the study merely from the historical standpoint is a phase of Geology as he conceded in 1932, but the major purpose is descriptive and, therefore, a major part of Geography. Thus many of his papers contain the word "geography" although they are in method geologic. Only in Europe was his definition of Geomorphology as Geography taken seriously. Only in Germany where, as has been shown, his work was most questioned were professorships of Geography filled by geomorphologists. In his own country his teaching in this respect has been rejected.

### WORK IN OTHER PHASES OF GEOGRAPHY

Davis's interest in Geography was not limited merely to the physical side. He encouraged other forms of Geography. In a continuous propa-

ganda, by letter, by lectures and in published papers he advocated all forms of geographic research and study. His strong interest in the work of this Association testifies to his broad interest in all aspects of Geography. His own research work he held largely to the phase in which he began but he encouraged others in developing all branches of the subject. Many of the recruits to systematic political and human Geography were geomorphologists trained by him or by his disciples.

One of these students, an equally sincere and devoted geographer, has written regarding Professor Davis as follows:

> Those who knew Professor Davis as a teacher and friend testify to the many-sidedness of the man. His lectures to beginning pupils were prepared with great care, and were presented with such clarity and in so logical a sequence that the careful listener was as much challenged by the method of presentation as by the always interesting content. Advanced students were ever held to a high standard of accomplishment in preparation for the weekly seminars, and in the presentation of their material in both oral and written form.
>
> For many years Professor Davis had charge of the Special Students admitted to Harvard College, a work that he enjoyed greatly for it gave him the personal contacts with youth that he prized. Ever solicitous for a student's welfare, he kept in touch with many of his former students as long as he lived. In these contacts, whether face to face or by correspondence, Professor Davis exhibited the great humanness that was a sometimes hidden but very real part of his personality.
>
> Late in life, after fifty years of devotion to and advocacy of the subject he wrote "A Retrospect of Geography." Here is the mellow, the ripe viewpoint: Geography is complex—well, what of it? Geography is unbounded —so much the better; Geography requires in its several parts differing disciplines—well why not? "'All the world's a stage' . . . Landscapes and seascapes, modified by climate provide the scenery, slowly changing as the earth's crust is deformed and eroded or aggraded. There are no falls of the curtain; the play is continuous. . . . The whole force of the company is on the stage all the time . . . the only entrances and exits are births and deaths. Today's part of the play is Geography; the integration of the past is Geology."

### PROFESSIONAL STANDARDS

In closing this tribute to the great leader so recently in our midst, whose devotion to Geography was so many times and so eloquently expressed, I can not refrain from laying stress on his personal characteristics. He held to a rigid standard of achievement for himself and others. Every opportunity for learning must be seized eagerly and firmly. Not only must a scientist think but he must think clearly and toward a definite objective.

Each step in this thinking must be checked and rechecked for its accuracy. Truth is ascertainable and eternal and worthy of the best in a man's life. Persistently Professor Davis followed these principles, never sparing himself, a conscientiously and consciously industrious man. From early youth to great old age, he was ever alert to expend himself for principles as he saw them and to defend these principles. To him the method was, if anything, more important than the result. Thus many of his papers consist of two parts; an analysis of the probable results of processes, the deduction, and then a citation of the field facts which prove that one or another of the deductions is the correct explanation. This method he has bequeathed to us and whatever the awkwardness and ineptitude of the system in incapable hands, it still remains a standard both in the preparation and in the presentation of geographic results.

## BIBLIOGRAPHY

*Editor's Note:* It is the custom of the Association to publish bibliographies in connection with the memoirs of its past presidents. The unusually long bibliography of Professor Davis will be published by the National Academy of Sciences, accompanying a biography to be prepared by Professor Douglas Johnson. The Geological Society of America plans to publish in its *Bulletin* a list of the titles which bear on geology and physical geography. Already Professor C. F. Brooks has collected Davis's meteorological titles in the *Bulletin of the American Meteorological Society,* vol. 15 (1934), pp. 57–61.

In view of these compilations, in print and projected, no bibliography is published herewith.

*Harvard University,*
*December, 1934.*

# Titles and Abstracts of Papers
# Philadelphia, 1934

WALLACE W. ATWOOD.

*The Increasing Significance of Geographic Conditions in the Growth of Nation-States.*

(Presidential Address. Published in full in this issue.)

ROLLIN S. ATWOOD. (Introduced by Wallace W. Atwood.)

*The Inter-Community Trade of the Indians of the Utatlan Basin in Guatemala.*

Buried under the ancient Maya temples and mounds, and in the obscure historical records, definite proof has been found of widespread trade which reached at least as far south as what is now known as Peru and northward into regions which are now within the limits of the United States. Today, as it most certainly was in ancient times, the trading activities are an extremely vital part of the adjustment that the Indian has made in order to exist.

There are two aspects to the commercial activities as carried on by the Indians in the Utatlan Basin region. The first is trade in products brought to the local town or village market. Practically every type of agricultural product known to the modern world can be found in these markets. The number of persons from out of town attending these Sunday markets in Chichicastenango averages 6,000 to 7,000 on ordinary days and runs as high as 10,000 on feast days and holidays. On ordinary market days the number of individuals selling products in reserved areas in the plaza was found by actual count to be over 1,200.

The second aspect of the commercial activities of these Indians concerns the elaborate and highly organized inter-community trade. This is one of the basic adjustments that the Indians of Guatemala have made and it is most fundamental to an understanding of their life as it is carried on at the present time. It is undoubtedly true, moreover, that the trading methods, the means of transporting products, and perhaps even the routes followed, corresponds very closely to those used in ancient times. Each Indian or group of Indians follows definite prearranged routes decided on in a sort of caucus or small trade convention held in the plaza of Chichicastenango each Sunday. After careful study it was found that the Indians so arrange their trips as to travel through regions where different crops and products are produced and where geographic conditions have resulted in a marked

divergence in the needs and desires of the population. Each journey is carefully planned so that the products that the Indian starts out with, will be sold during the outgoing portion of the trip. For the return trip he obtains products from the most distant villages and communities producing entirely different types of products. Nearly all of the routes pass through towns located in the tropical lowlands before returning to the temperate highlands. Practically every town within a radius of 50 miles of Chichicastenango is visited by one or more Indians at least once a week. There are trade journeys, however, that keep the Indians away from home from 6 to 8 weeks. The longest followed with any degree of regularity at the present time are to Mexico City via Tapachula, and to San Salvador via Guatemala City.

WALLACE W. ATWOOD, JR. (Introduced by Wallace W. Atwood.)

*Erosional History of the Wind River Range, Wyoming.*

The magnificent Wind River Range, rising in places to over 13,700 feet, is located in northwestern Wyoming approximately 50 miles southeast of Grand Teton National Park. The unbroken mountain range is over 60 miles long and has a width of 25 to 30 miles.

During the summer of 1934 the author, accompanied by Dr. Wallace W. Atwood and a small group of graduate students, traversed the full length of the range following the high-line trails. Preliminary study was also made in the low country and it is hoped that this will supplement the glacial studies carried on by Wm. C. Alden on the southwest margin of the range. With the completion of additional field work a joint report will be made.

Viewed from the west the Wind River Range exhibits one of the finest beveled surfaces to be found anywhere in the United States. Unlike most high peneplains in the Rocky Mountains, this unusually well developed surface is below the crest of the range throughout most of its extent, reaching the summit only at the extreme northwestern end of the range where upturned sediments, fault planes, and old granitic rocks are all truncated. The surface, known as the Wind River Peneplain, is most readily identified at 11,600 feet in the vicinity of Green River where streams have cut canyons 3,500 feet deep thereby exposing the underlying structure in a remarkable manner. Above the peneplain stands a large monadnock ridge, portions of which rise more than a thousand feet above the erosion surface. Gannett Peak and Fremont Peak stand out as higher portions of this resistant divide. Below the Wind River Peneplain there is one very definite youthful cycle and possibly a second one recognizable only in the lower country. The correlation of these stages with those in the Front Ranges

of Colorado and the Medicine Bow Mountains of Wyoming has not yet been completed. Certain conditions suggest that the Wind River Peneplain is comparable to the Rocky Mountain and Medicine Bow peneplains, while other relationships indicate that the surface is much older. In addition to the erosional features produced by stream action, the Wind River Range exhibits the work of severe mountain glaciation. On the northeastern edge of the range there is a series of young Yosemites where over-steepened valleys and granite domes record the work of glacial scour. In the Green River valley, on the northwest side, are giant moraines representing two and possibly three distinct stages of glaciation. One set of moraines is found 30 miles from the point where the glacier issued from the mountain area. The recognition and interpretation of these glacial features has helped greatly in solving the erosional history of the entire range.

C. P. BARNES. (Introduced by O. E. Baker.)

*The Long-lot Farm and Economy in Public Services.*

The strip-wise division of land into farms so common in Quebec is an effective device for making a given length of road serve a large number of farms. The close spacing of dwellings made possible by this type of farm land division also permits notable savings in the cost of distribution of power, telephone and delivery services as compared with the more dispersed settlement characteristic of areas having square or irregularly shaped farms.

To the saving in cost of road construction and maintenance there is added the saving in land released from use for roads which would be necessary in an area of dispersed settlement.

If quarter-sections one-fourth mile wide and one mile long had been used as homestead units instead of square quarter-sections, in the central States, and roads then built on alternate section lines, with dwellings on opposite ends of adjoining quarter-sections, only half as much road mileage would be necessary. Two acres of land per farm that would be required for roads in the present settlement pattern would be available for agriculture. One mile of electric power line could serve eight farms instead of about 2.7.

The disadvantage in internal economy of the farm in having long, narrow fields, namely, the greater labor in cross cultivation of row crops, the greater length of fencing, and the greater distance to the farthest part of the farm, are in a measure overcome by the greater efficiency in plowing, harrowing, cultivation and machine harvesting in long fields, because of the fewer turns necessary.

Economy in public services made possible by the long-lot farm division would not justify reorganization of the settlement pattern in established

communities, but it merits consideration in the establishment of new settlement.

C. E. BATSCHELET. (Introduced by F. E. Williams.)

*Problems Involved in Compiling the State Minor Civil Division Maps.*

The Bureau of the Census has completed a set of state outline maps, showing the minor civil divisions (townships, precincts, or similar subdivisions) and incorporated places. Prior to this compilation there were but few maps of this character in existence and the general public had no key to the published Census figures by minor civil divisions.

During the preliminary work for the 1930 Census, the Bureau of the Census secured a map showing the political subdivisions for each county in the United States. For many counties, the base maps were poor, and did not permit the accurate delimitation of the minor civil divisions. However, the need for these maps convinced the Director of the Census in 1930 that the work should be commenced. Not until the past year were sufficient funds provided for this work by the Federal Emergency Relief Administration.

It was necessary to consider a number of technical questions and also to complete the work within a definite period. Some of the outstanding technical difficulties were:

(1) Should the maps be prepared using the state as a unit or should the entire United States be covered by quadrangles of uniform scale? If the maps had been published in atlas form, quadrangles should have been used, but for many purposes, the state forms the unit and, therefore, it was desirable to have individual state maps. Furthermore, many areas were so congested because of place names (minor civil divisions and incorporated places) that, if a uniform grid were used, the scale for the entire project would have to be constant and based upon the most congested area. This was not deemed desirable.

(2) What scale should be used? The scale of a map should be determined from the amount of printed material which is to be placed thereon. However, for the minor civil division maps, this would have required the using of a great number of different scales, which was not desirable. It was necessary, therefore, to select a scale which would be applicable to as many states as possible and it was found that, for about two-thirds of the states, a scale of approximately sixteen miles to the inch could be used very satisfactorily. For the other states, it was found necessary to use scales of four, eight and twenty-four miles to the inch.

(3) What projection should be used? Undoubtedly, the Albert Equal Area projection would have been the most desirable but this would have

necessitated the preparing of a grid based upon this projection, which would have considerably delayed the work. As the United States Geological Survey maps, scale 1: 500,000, based upon the Modified Polyconic and Lambert Conformal Conic projections, were available, it was decided, in order to expedite the work, to use these maps as a base. These base maps were used for all but a few states.

(4) How best map the county subdivisions, which vary because of differences in state laws? The determining of the boundaries of the minor civil divisions involved a considerable amount of correspondence and a check of the county material in the files of the Bureau of the Census. In a number of instances the county officials frankly admitted that the minor civil division boundary lines were only approximations, since there were no surveys available. However, they stated that, in their judgment, the lines were approximately correct.

While it is realized that the minor civil divisions maps may not be ideally adapted to all purposes, they will undoubtedly prove invaluable to geographers, statisticians, planners, economists, and others.

CHARLES F. BROOKS.

*Thirty Climatic Maps of North America.*

For the first time detailed climatic maps for North America as a whole have been prepared, thanks to the requirements of the Köppen-Geiger Handbuch der Klimatologie, the cooperation of the official weather services, the assistance of graduate students in Clark University, and grants from the Milton Fund of Harvard University.

There are thirty maps, including: temperature, pressure, storm tracks, rainfall, snowfall, humidity, cloudiness and thunderstorms. The six sea-level isothermal maps for alternate months show strikingly the continental *vs.* marine influence on temperature. The isotherms in winter bend southward over the interior of the continent, especially in the East and behind the protection of mountain ranges, and in summer bend northward, chiefly where they bend southward in winter. Sharp contrasts mark the coastlines, especially in spring when the land is warming very rapidly and in late autumn when it is cooling. The January and July maps look much like topographic maps; less so in winter, when valleys are cold, than in summer, when the valleys are much warmer than the heights. The mean annual range of temperature combines strikingly the effects of land *vs.* water and of altitude on the annual course of temperature. Between the equable Pacific coast and the extreme Great Valley, the contrast is most marked. The mean annual maximum and minimum temperatures show the extremes to which our temperatures usually go in the course of the year. The marine

effect in reducing the extremes is not so pronounced as in the case of mean temperatures, for but one hot and one cold day in a year, with wind from the land, are required to establish the extremes.

The sea-level pressures indicate the prevailing trends of the wind, inward toward the continent in summer, and outward in winter, while the tracks which have been taken by lows and highs show roughly the chances of variability in weather winter *vs.* summer. Practically all parts of the coast are crossed by the tracks of individual storms and there are no marked concentrations.

The precipitation maps bring out not only the decrease inland and behind mountains, but also the pronounced decrease in precipitation owing to the lower temperatures and consequent reduced absolute humidities in the north. The annual snowfall map shows this reduction less strikingly; nevertheless, the snowfall of the Arctic is less than that of the northern United States and southern Canada. The relative humidities and cloudiness have distributions resembling the precipitation, except that the amounts increase toward the north, in spite of decreased rainfall. Finally, thunderstorms, representing convectional rains, decrease rapidly in number north of the 50th parallel, beyond which moist tropical air masses rarely penetrate.

ROBERT M. BROWN.

*The Business of Recreation: a Preliminary Study.*

The value of the Recreational Business to States and towns has not been greatly emphasized in Economic Geography, mostly possibly because no tangible data were available. During the last few years serious attempts have been made to estimate the value of this business and new advertising campaigns inaugurated to increase it. New England is fast approaching the decision that next to her textile industry recreational business is her most lucrative occupation. California, Colorado, Michigan, Wisconsin, as well as New England, are investigating the possibilities of this enterprise. Canada is a determined rival for some of it. The paper presents some findings of investigators in this field, offers a brief bibliography and opens the field for further study.

KIRK BRYAN.

*History of the Rio Grande in Central New Mexico.*

(No abstract received.)

KIRK BRYAN.

*William Morris Davis—Leader in Geomorphology and Geography.*

(Invited Memoir. Published in full in this issue.)

FRED A. CARLSON. (Introduced by Guy-Harold Smith.)

*Hydrography of the Valley of Mexico.*

For centuries the Valley of Mexico has been the scene of continuous struggle to prevent floods or to reclaim land for urban and agricultural uses. To obtain these ends many plans have been tried but the results have been only partial solutions due either to the inadequacy of the projects or to new requirements associated with the increase in population and urban expansion. Among the major works to control drainage in the Valley are (1) the Netzahuacoyotl levee, now used as a part of the highway from Mexico City to Pachuca, (2) the Nochistongo outlet, and (3) the Canal del Desague. Reasons for the preeminent significance of the drainage problems can be in part attributed to the oro-hydrographic nature of the Valley of Mexico. It is a natural closed basin, embracing a comparatively level plain, interrupted by hills, lakes, and numerous rivers. The maximum rainfall, amounting to 419 mm., or 75 per cent of the annual precipitation, occurs during the months of June, July, and August. Much of the area is deforested, another condition adding to the difficulty of controlling surface drainage.

GEORGE B. CRESSEY. (Introduced by Wallace W. Atwood.)

*The Fenghsien Landscape: Human Adjustments in the Yangtze Delta.*

The delta lands south of Shanghai are intersected by a network of canals which average 380 feet apart and have a length of 27.8 miles per square mile. These waterways give the region its distinctive stamp, for they are the arteries of travel, the source of irrigation water, furnish food from fish and clams, supply fertilizer in the form of canal mud or aquatic plants, serve for washing food and clothes, and for drinking. The area is 12 feet above sea-level and is protected by a system of maritime dikes. As the delta builds seaward, new dikes are constructed to reclaim the mud flats. Four such dikes have been built southeast of Fenghsien since 1584 in a distance of three miles. Cotton and rice are the chief summer crops, with wheat and broad beans during the winter. Salt is evaporated from sea water outside the dikes. The rural population approaches 2500 per square mile.

DARRELL HAUG DAVIS.

*An American Finland.*

The Finland Community, located in a typical sub-marginal agricultural area in northeastern Minnesota and separated from adjacent communities by distinct breaks in occupation, was settled by Finnish homesteaders between 1895 and 1906. The early occupance pattern was established prior

to road or rail construction, but the coincidence of favorable locations for highways and farms, plus subsequent abandonment of many of the more inaccessible upland homesteads, have resulted in the present attenuated shape, with the farms concentrated on or near the two major highway axes which serve as the only outlets since the removal of the rail line in 1921.

Peripherally, the essentially stationary population is Scandinavian, principally Swedish, but the "core" of the Community is Finnish, with farmsteads and buildings to correspond, and with excessive percentages of males and in the older age groups. The Community represents a "backwater" in which have accumulated many to whom the simplicity of subsistence existence makes a strong appeal.

Ownership and occupation of the land, indicative of agricultural undesirability resulting from steep slopes, thin soils and unfavorable climatic conditions, is emphasized by the small amount of cleared land: 3 per cent of the total area and 20 per cent of that of individual farms, mostly in hay and potatoes. Abandonment of the upland farms, plus continually decreasing use of land for cultivated crops, is causing agriculture to go down hill, both figuratively and literally. With small returns from agriculture, minor supplementary sources of income assume great relative importance.

Of the total acreage, 42 per cent is tax delinquent for five or more years; 61.67 per cent of the 1932 taxes were uncollected September 1, 1934. Delinquency is most serious for the larger holdings and for the unoccupied land. This condition threatens the economic stability of the community as it narrows the tax base and adds unbearably to the burden of those who pay.

Insurance of the future does not, however, necessitate any displacement of population; such a procedure would be a distinct mistake. Specifically, the following recommendations, if followed, should make it possible for the present population to secure an entirely satisfactory living in the area:

1. The boundaries of the Finland State Forest should be extended to include the entire community.

2. Forest industries should be established.

3. Recreational assets should be developed by camp grounds and cabins to meet an existing demand.

4. Agriculture should be encouraged to supplement other sources of income and outlets for surpluses should be developed.

A *laissez-faire* policy dooms the Community; the State should initiate a policy which should prevent this occurrence.

STANLEY D. DODGE.

*Population Regions of New England, and Their Significance in the Analysis of the Culture Landscape.*

The classification of the categories of growth and decline of population in New England, township by township, reveals certain significant groupings of similar categories. The classification of the dates of population peaks suggests the economic base for the growth or maintenance of population. Classification of revival of growth shows revival in some areas attendant upon the maxima of population in others. Deductions are made concerning the nature of the corresponding changes in the culture landscape.

LEON DOMINIAN.

*Preliminary Notes on the Geographical Basis of the Spirit of Tolerance.*

Civilization and Tolerance are products of human culture; hence they are related to geography. The Roman outlook on foreigners as barbarians was erroneous owing to lack of geographical knowledge. The influence of sectionalism in the United States is comparable to regionalism in Europe and goes back to pre-independence period. Proper acquaintance with the land is necessary to the development of tolerance. The frontier is a factor in the development of tolerance. The physical basis of England's former free trade policy. Cultural growth in England as a result of sixteenth century discoveries.

The paper is fragmentary but will serve, it is hoped, to reveal an interrelation which deserves ampler study.

ROBERT BURNETT HALL.

*Regionalism: A Résumé.*

(To be published in full in a later issue.)

RICHARD HARTSHORNE.

*The History, Nature and Scope of Political Geography.*

With a view of determining the nature of political geography, and to outline and define its scope, a survey is presented of the development of this field, particularly the work of the past two decades in the German, French, and English publications. For most geographers of the nineteenth century, and for many since, political geography was essentially an aspect of the geography of history. During the Great War and Peace Conference period it was an applied subject practiced by many geographers called directly or indirectly into national service. Systematic study of political geography began with Ratzel who has been followed by a few notable students in Sweden and France and by an increasing group in Germany.

Of recent writers one main group regards this field as the study of the relations between political activities and the natural environment. This

definition provides them with a wide field in which apparently neither the system of organization nor the outer limits are even approximately marked. For another group political geography is the study of states as areas, to be related to other characteristics of areas. Analysis or interpretative description, of the areas of states constitutes the major part of their work. The area of a state is studied as a whole, in terms of: (1) its size, not merely absolute square mileage, but its effective size in productive land and resources; (2) its form or shape; (3) its location in relation to other areas, both land and sea; and (4) its boundaries. The internal structure of the state area involves: (1) provinces or geographic regions of similar cultural (or natural) landscapes; (2) areas of predominantly similar population characteristics; and (3) the administrative center or centers.

This study requires some interpretation of the present area, in terms especially of (1) original "kernel" areas; (2) major limiting zones; and (3) the direction and character of territorial growth. An appraisal of the present area and its problems includes (1) the degree of conformity of the present political area with the underlying natural and cultural landscapes and areas of similar population characteristics; and (2) the dgeree of "harmony" or "organic form" achieved in such an association of areas, economically and politically.

Various topics frequently included under political geography are discussed; some are regarded as debatable, others as distinctly extraneous to geography, if not to science in general. Special consideration is given to the German school of Geopolitik. The publications cited provide a fairly complete bibliography of recent work in the field.

RICHARD HARTSHORNE AND SAMUEL N. DICKEN. (Introduced by Richard Hartshorne.)

*A Common Statistical Basis for Delimiting the Agricultural Regions of Europe and North America.*

The agricultural use of the land is essentially similar in the regions of the United States (excepting the South) and Canada to that in regions in Europe. This permits a classification of types of agricultural regions applicable to both major areas. The classification is developed and mapped on a strictly statistical basis, presumably for the first time. The mapping depends on official statistics by counties, departments, or provinces. The major types fall into two groups: Mediterranean agriculture, characterized by the major importance of vineyards and orchards of sub-tropical fruits, with irrigation, and, usually, with wheat and barley as major crops; and grain and livestock farming, in which a large part of the land is in feed crops, in hay, and summer pasture for livestock, used both for dairy prod-

ucts and for meat, and wheat and/or rye are important as bread-grains. Of the latter group one type is characterized by the major importance of corn primarily as a feed crop, one by the diversification in bread grains and the small-grain livestock feed crops, the other two by the commercial specialization in dairy and meat products, or in extensive grain production, respectively. The criteria for dividing these regions on the map follow. In Mediterranean agriculture vineyards and orchards occupy over 15 per cent of the cropland. In corn-wheat-livestock farming corn alone occupies at least 2 per cent of the cropland and with wheat at least 30 per cent; tobacco is less than 15 per cent, and cotton less than half of the corn acreage. In the small-grain-and-livestock regions corn is of little or no importance, as defined above, but wheat and rye occupy over 10 per cent of the total crop and pasture land. In areas of hay-pasture-livestock wheat and rye fall below this figure and the land in hay and pasture is greater than that in tilled crops. In extensive grain production the animal units are less than 20 per 100 acres of cropland, farms are large and yields per acre low. Minor regions of truck farms and commercial orchards are recognized where commercial orchards and vegetable crops take up more than 20 per cent of the cropland. For all these types a minimum limit is placed where all crop and pasture land constitute but 10 per cent of the total area.

Wm. H. Hobbs.

*Peary and His Polar Explorations.*

The year 1934 marks the quarter centennial of the Discovery of the North Pole by Robert Edwin Peary after fate had blocked his attempts through more than a score of years. His final success was due to the perfected plan which had grown out of defeats that had finally pointed the way to success. In large measure, also, it was due to favorable weather, which in so many of the earlier expeditions had been wanting. As an example of personal prowess or the endurance of hardships by Peary himself, it was far surpassed by several of his earlier Arctic expeditions, notably the crossings of North Greenland in 1892 and 1895, the rounding of the north coast of Greenland on the sea-ice in 1900, and the rounding of Grant Land to the westward to attain Cape Thomas Hubbard in 1906. For all these earlier expeditions, the success of which brought Peary medals and decorations from both American and European geographical societies, the proof that he reached the goals he claimed has in every instance been furnished through the finding by other distinguished polar explorers of the records which Peary deposited in his cairns at all points where he turned back, as well as at important intermediate points.

Peary was scrupulously careful in all his observations, as has been amply attested, not only by those who were his subordinates, but by all his colleagues in polar exploration who have reached the goals that he first attained.

Unfortunately the North Pole offers no such opportunity for easy proof, since it is located upon a floating aggregation of ice floes. A record deposited in a cairn, to be recovered, would require that the later explorer travel close upon the heels of the first, since storms shift the position of the ice floes hundreds of miles. Save for the great hazard of the weather, which fortunately this time favored the explorer, the achievementwas not a particularly difficult one for the seasoned explorer after leaving Bartlett for the dash to the Pole at the advanced position of 87° 47′. Speeds made both to the Pole and returning are surpassed in the record of Peary himself, as well as in those of many other well-known explorers who have sledged over sea-ice in the Arctic. Unfortunately, Bartlett could not accompany him, since it was necessary that a navigator should lead the last supporting party back to the base at Cape Columbia. His attainment of the Pole has been confirmed by distinguished experts who have gone over his observations, and every geographical society of note of Europe and America has conferred its greatest gold medal upon Peary for his unique achievement.

GEORGE DAVID HUBBARD.

*Geographic Regions of European Russia.*

The Administration in Russia has done a prodigious amount of redistricting, changing of names, and regrouping of provinces into Republics, Autonomous Areas, Autonomous Republics, and Autonomous Soviet Socialist Republics. Boundaries of these divisions and subdivisions are said to be "racial or geographic" but they are usually far from having any relation to the fundamental physiographic, climatic, resource, and occupational factors upon which geographic regions are usually based.

An extended effort has been made to find bases for subdivisions of Russia in Europe with the result that a score of regions have been tentatively delimited and grouped into six categories. Five are called the Northern Extractive Regions; (a) Tundra, (b) White Sea Extractive and Commercial Region, (c) The Lake Region—Mines and Forests, (d) Coniferous Forests, (e) North Ural Mountain Forests and Tundra. Four regions are called the Central Industrial Regions; (a) Leningrad Industrial and Commercial Region, (b) Moscow Region—leading Industrial Area, (c) Valdai Hills—Agriculture and Industrial, (d) Middle Urals Region —Mining and Industry. Three are grouped as the Central Rural Regions; (a) Glaciated Plains, (b) Upper Don, (c) Volga Plains. Another three

are called the Southern Plains group; (a) Ukraine Wheat Region, (b) Donetz Industrial Region, (c) Mid-Volga New Industrial Region. Three more are called the Grazing Lands; (a) Southern Ural Region, (b) Caspian Low Plains, (c) Manych Cattle and Farm Lands. The last three are called the Southern Mountain Regions; (a) Crimean "Riviera," (b) Caucasus Region—Mining, Forestry, Agriculture, (c) Transcaucasia—Rural and Industrial Region. The reasons for selecting these regions, their boundaries, unities, differences, and interrelations are discussed.

G. DONALD HUDSON. (Introduced by Charles C. Colby.)

*A Quantitative Approach to Land Use Problems.*

The need for further developments in methods of geographic reconnaissance has been noted with increasing frequency during recent years. An experiment in such methods constituted a part of a pattern study of Augusta County, Virginia, an area of 1006 square miles, made in the autumn of 1932. The steps in the experiment were: (a) a rapid reconnaissance survey of the county; (b) the application of an arbitrary grid that divided the county into 115 rectangles each enclosing ten square miles; (c) the accumulation of data representing each rectangle from two sources, namely, traverses made by measuring the road frontage of types of land utilization with a double-crop-frontage-meter, and individual census schedules covering three sample farms; (d) the plotting of these data by rectangles; and (e) the portrayal of patterns by the use of isopleths. In plotting the data from the traverses, the percentage of the total measured road frontage of a given rectangle that was occupied by each type of land utilization, represented the percentage of land so used in that rectangle. Data from the three sample census schedules for each rectangle were used in the form of averages for the rectangle they represented. Concurrently with these procedures, careful field notes were made, the literature was investigated, and appropriate agencies were consulted—all of which contributed to the accuracy of the final portrayal and interpretation of the patterns being studied. Thus, the methods described involved the application, in some respects slightly modified, of established techniques of geographic research. In addition, an equal-area, small-mesh grid was used giving the traverse areal as well as lineal application, and census data were distributed over a sizeable area in units less than townships.

There is conclusive evidence that the amount of detail obtained is adequate in terms of the scale of operations adopted. Major items that should be noted are: (a) the area of each rectangle was small enough in terms of the agricultural pattern of the county to provide data sufficiently detailed to bring out not only the patterns of the uses of the land, but the efficacy

of these uses; (b) the entire county was covered, 90% by field measurements, 75% by census data, and 100% by field observations; (c) traverses are an established form of sampling, and, in most cases, census data covered 10% or more of the rectangles they represent, a relatively large sample; (d) the data covered all major agricultural and other rural items; and (e) in all cases the data were sufficiently detailed to reveal the relationships between the uses made of the land and their physical settings. The accuracy and reliability of the results are indicated by: (a) the high degree of coincidence between the areal distribution of identical items, one distribution based on field measurements, and one on census data; (b) the high degree of coincidence between the areal distribution of closely associated items, and (c) the absence of significant discrepancies when the results of field and census data were checked against field observations.

ELLSWORTH HUNTINGTON.

*Caravan Cities, Climate, and History.*

Historians have long believed that history can be understood only in the light of geography. Nevertheless, the majority of them fail to utilize more than the mere locational phases of geography. A conspicuous example of this is seen in their attempts to explain the growth of such cities as the famous rock-hewn Petra, Palmyra, with its superb colonnaded streets, and Dura Europas, high above the Euphrates River. Certain historians have gone so far as to cite these places as typical caravan cities, and yet to assume that the conditions of climate and agriculture in the past were like those of today. A new map showing the distribution of ruins in comparison with inhabited villages in Palestine and Syria shows that Petra did not grow up as an isolated rendezvous of caravans in the desert, but as a commercial center in the midst of numerous agricultural villages. Palmyra is also surrounded by ruins, but not in any such large numbers. A study of the topography shows that the sudden rise of that city to fame depended partly upon the climatic conditions of the past and partly upon the fact that a new method, the Kariz, or underground tunnel of the Persians, was introduced at the same time that cycles of climate were forcing caravans to follow a more northerly route than formerly. The systematic distribution of ancient ruins in Syria and Palestine agrees with the only available ancient meteorological record in showing that when they existed westerly winds and cyclonic storms were much more prevalent than now. Certain historians, such as A. J. Toynbee, not only recognize the importance of geographical conditions, but actually utilize them. One of the important steps in the future of geography lies in assisting historians in the geographic interpretation of history.

PRESTON E. JAMES.

*The Distribution of Industries in São Paulo State, Brazil.*

During and after the world war there was a considerable development of manufacturing industries in Brazil, behind tariff protection. The pattern of these industries in São Paulo state is revealed by a state census taken in 1929. The greatest concentration of large and small enterprises is in São Paulo city or in its suburbs. Almost all the inland towns of any importance have small industries with local markets; but the larger manufacturing establishments are located in the interior in only a few cases. The advantages of São Paulo city and its neighboring towns seem to include proximity to the chief market, availability of hydroelectric power, and, to a certain extent, focal position with reference to the railroad lines.

W. L. G. JOERG.

*Henry S. Tanner of Philadelphia: His Place in American Cartography, 1815–1850.*

Tanner (1786–1858) merits attention not for antiquarian reasons but because, although a commercial map maker, he was truly a scientific cartographer. He produced, for his time, the outstanding map representations of the territory of the United States based on a critical study of the source material. These are laid down mainly in two publications.

The *New American Atlas,* first issued in five instalments between 1818 and 1823 and running through various editions at least to 1839, is remarkable for its concept of uniformity of scale. Each state or group of states—those on the frontier as well as the older settled ones—is shown on the scale of 15 geographical (about 17 1/3 statute) miles to the inch, or very nearly 1:1,000,000, a scale that would be large for most states even in a modern atlas. The sources are discussed in 18 introductory folio pages of text entitled "Geographical Memoir." The announcement accompanying the first instalment, dated July 10, 1818, in its keen analysis of the problem of American map representation of American territory, might still well serve as a charter for American cartography after a lapse of considerably more than a century.

The second publication is a large map of the United States as a whole on exactly the scale of 1:2,000,000 (the linear scale on the map itself indicates 32 miles to the inch; the author's publication notices refer to it as on the scale of 30 miles to the inch). The Mastery of the cartographic sources relating to the United States that Tanner had acquired through his previous work is revealed in the accompanying 108-page *Memoir on the Recent Surveys, Observations, and Internal Improvements in the United States.* The map was first published in 1829 and ran through numerous editions to 1844.

LESTER E. KLIMM. (Introduced by F. E. Williams.)

*The Rain Tanks of the Aran Islands of Ireland—A New Adjustment to Karst Conditions.*

Within the past ten years the people of the Aran Islands have adopted a system of rain tanks for catching water in their upland pastures. These are a very neat solution to the problem of water for cattle in an upland whose creviced limestone surface retains none of the abundant rainfall in surface waters. The recent adoption of this system is due to the fact that before it could be developed the natives had to be familiar with the idea and with the use of cement necessary in their construction. Both of these have come only within the last ten years.

EARL E. LACKEY. (Introduced by N. A. Bengtson.)

*A Variability Series of Frost Maps of Nebraska.*

Maps carrying information concerning the *last killing frost of spring* and the *first killing frost of autuma* convey ideas concerning the mean or average dates only, giving no hint as to the variability or spread before and after the mean. Moreover, because a few erratic departures so frequently occur, the same number of killing frosts before as after the mean is quite unusual. For this reason, it seemed advisable in this study to depend on the median and percentile dates rather than on the dates of the means and standard deviations. This procedure seemed the more reasonable also because killing frosts are expressed in terms of dates rather than in quantitative terms as is the case with rainfall and temperature.

From the record of any given station the dates on or after which killing frosts in spring have occurred are available. Corresponding data are available also for autumn. Frost data for twenty years or more have been kept at about seventy stations in Nebraska. For each of these stations the 20-, 40-, 60- (median), 60- and 80-percentile dates were calculated both for spring and autumn. From these data ten maps have been constructed, five for spring and five for autumn. The date on any frost line running through the 20-percentile spring map, indicates according to the record that 20% of the time the last killing frost of spring has occurred on that date or later. On the 20-percentile autumn map the date on any line means according to the record that 20% of the time the first killing frost of autumn has occurred on that date or earlier. In a similar manner the 40-, 50-, 60-, and 80-percentile maps for spring and for autumn, respectively, are interpreted.

The uniqueness of this variability series of frost maps lies in the fact that they faithfully portray on separate maps not only the median dates on which killing frosts have occurred in all parts of Nebraska, but also the 20-, 40-, 60-, and 80-percentile dates. The spring maps indicate respectively the

percentage of the time that a killing frost has occurred in Nebraska on a given date or later. The autumn maps show respectively the percentage of the time that a killing frost has occurred in Nebraska on a given date or earlier.

It is not contended that this series of maps may be used to forecast what future conditions in Nebraska will be, but they do in fact give a summary of what the conditions in the past have been. Only to the extent that the record of the past may be used as a criterion in forecasting the future may this Variability Series of Frost Maps be utilized for prognosticating purposes.

HOWARD H. MARTIN. (Introduced by F. E. Williams.)

*A Geographical Interpretation of the Japanese Population Curve.*

Following a period of over two centuries during which the Japanese population was static, an upward trend began in the seventies. The Imperial Census of 1872 showed a total population of 32 million. The net annual increase mounted year by year until it reached 500,000 per year early in the twentieth century, and 800,000 during the decade 1920–30. At present it is approximately one million per year, with an estimated total population of 68 million on October 1, 1934.

This 60-year period in which the population of Japan more than doubled has been marked by industrialization along western lines, the expansion of buying power at home, and the development of new markets abroad for surplus Japanese manufactures. It has also been a period of increasing urbanization. Today 45 per cent of the Japanese are classed as rural-agricultural, and a graphic analysis of population increase in 5-year intervals since 1872 shows a correlation between the net increase in total population and the proportion now engaged in the newer-type industries, trades, and commercial activities.

This population curve may be projected for two decades at the rate of one million increase per year, on the authority of Dr. Uyeda, leading population expert. This raises the question as to the geographical possibilities of Japan absorbing an additional twenty million people in the next twenty years. Analysis of the means of support at home discloses that the maximum additional land which may be brought into cultivation is less than 2 per cent. Further intensification of agriculture upon the present cultivated land would be difficult and probably uneconomic. Emigration to foreign countries has either been forbidden, or has been so limited by quota laws that only a few thousand Japanese can be sent out yearly. Hokkaido still has some unoccupied farm land but the climate is unsuited to the intensive type of agriculture favored by Japanese farmers; hence they are reluctant

to migrate northward. The same climatic difficulties apply to Korea and Manchukuo; there, also, agricultural colonists compete with peoples who have a lower standard of living. Population limitation by birth control has made little headway in Japan. Consequently the most logical means of supporting 20 million more people during the next two decades is a continuation of the present plan—increased industrialization and the development of more foreign markets. This policy is advocated by most Japanese officials, publicists, economists, and sociologists.

This plan will intensify the problem of raw materials and fuels. It is questionable whether the Japanese have sufficient bargaining power to secure and hold all the foreign markets necessary. Unless effective long-range planning is done, the population problem will become acute in domestic affairs and complicate Japan's foreign economic relations.

FRANÇOIS E. MATTHES.

*Evaporation of Snow on Our Western Mountain Ranges.*

Ablation of snow, in general, is effected partly by melting and partly by direct evaporation. The proportionate losses by evaporation vary greatly with climatic conditions and increase rapidly toward the higher altitudes, where under certain conditions they may reach 100 per cent of the total. This is true notably on those of our western mountain ranges which have a prevailingly dry summer climate with abundant sunshine. The highest snow fields on those ranges—at altitudes over 13,000 feet—literally evaporate into thin air.

These high snow fields waste away during the summer months with deeply pitted surfaces, the hollows sometimes attaining depths of two or three feet, so that the partitions of crystalline snow between them assume the form of sharp blades and pinnacles. Toward the lower levels the pockets decrease progressively in depth. At altitudes ranging from 8,000 to 10,000 feet, according to the latitude, they are as a rule only a few inches deep.

The sharp snow pinnacles at the higher levels have long been known to mountaineers as "nieve penitente"—a term that comes from the Andes of South America. For scientific purposes, however, it seems desirable also to have suitable terms for the pockets, which are really the primary forms and often are spaced far enough apart so that areas of level snow remain between them. For the shallow depressions that are common at the lower levels the term *suncups* is proposed, and for the relatively rare deeper hollows that develop from suncups only at very high altitudes the term *sunpits* is proposed.

The suncupped and sunpitted snow fields on our western mountains yield but little melt water. This water, percolating through the mantle of frost riven rock débris on the mountain slopes, is the essential agent in the processes of nivation and solifluction. There is not enough of it, however, to produce streamlets capable of doing significant erosional work, and as a consequence the mountain slopes at those high levels remain unfurrowed by gullies and ravines. It follows that the suncupped and sunpitted snow fields on our western ranges are to be discounted as sources of water, and at least above certain altitudes are to be eliminated from estimates of potential run-off based on snow surveys.

FRANK A. MELTON. (Introduced by Samuel Weidman.)

*Meander-scroll and Meander-bar Plains.*

The meanders of floodplain streams are of two types, the immediate geological causes of which appear to be somewhat different. One type, which is here called the *scroll* meander, is due to deposition, during stages of high water, of elongate curving *scrolls* against the inner bank of the low-water channel. Many floodplains are composed of an interlocking nest of such scrolls which when typically developed, are narrow, tapering, and gracefully curved. The outer eroding bank is usually cut at such a rate that the low-water channel maintains nearly uniform width as it shifts through the floodplain. The simplest explanation for this symmetrical relationship of smooth curve and uniform width is one which has long been used—that the scroll-building on one bank is the immediate cause of lateral corrasion on the other. Examples are found in the Connecticut river near 44° N. Lat., in the Pembina river of Manitoba, and in many other streams of humid regions.

The other type of meander has received slight attention. The writer believes that the immediate cause of meandering in this case is erosion of the outer bank of the low-water channel at such a rapid rate that deposition against the inner bank fails to keep pace. At all events, certain rivers, especially in arid regions, display low-water channels of very unequal width. On the Colorado below the Boulder Dam the minimum width is less than one-tenth of the maximum, which is commonly at the place of greatest curvature. The outer bank appears to have collapsed before the shifting current. Deposition against the inner bank has taken place in an irregular fashion; there is built, instead of symmetrical scrolls, a series of nondescript *meander-bars* which often leave unfilled sloughs behind them. It seems clear that erosion of one side is not everywhere balanced by equally rapid deposition against the other.

Those floodplains resembling the Connecticut may be called *meander-scroll plains*; those resembling the Colorado, *meander-bar plains.*

ROBERT S. PLATT.
*Field Approach to Regions.*
(To be published in full in a later issue.)

SIDMAN P. POOLE. (Introduced by Robert B. Hall.)
*The Rôle of Geography in State Planning.*

Future development of our natural resources has ceased to be a matter for mere academic discussion since states and the nation have set up boards or committees charged with the task of drawing up plans for the highest and best use of all aspects of the environment in which we find ourselves. New York during the past year has joined those states which are grappling with this problem. The Governor appointed a temporary advisory body, The New York State Planning Board; committees of this board were set up; a staff hired and the survey of the state's resources started.

The problems that these committees discussed during the year are familiar ones to geographers everywhere. Land utilization, marginal and sub-marginal lands, road and field patterns—these topics are suggestive of both the subject-matter and the phraseology that committee members have been dealing with.

Examination of the reports submitted to the Board illustrates the reliance upon geographers, geographic methods, and technics and indicates that the bulk of the basic material considered is geographic in its nature. State maps of relief, climate, soils, minerals, populations, highways and power sites served as the foundation of most of the reports and of the recommended policies. The need of further, more detailed and more varied maps was felt and ways and means of best securing these was suggested as well as the necessity of assembling and preserving all present and future maps of value to scientists, business men, farmers and legislators. These cartographic data are considered essential for the integration of population and environmental problems. For this integration, the Board's utilization of trained geographers indicates their awareness of the value of geographic training.

Governmental planning movements offer varied possibilities for Geography and the geographer. Geography may become merely the handmaiden of political cliques. Or on the other hand, the trained geographer may be the man called upon to make the recommendations in these matters of State planning rather than the lawyer or the sociologist.

We may be entering a significant period in geographic history when more and more the schools of geography will be asked to furnish these trained men to government and industry, just as chemists and geologists have long been furnished. If this new emphasis on geographic work does develop, then it behooves the universities to overhaul the courses and training they are offering. Further than this, if geographers in increasing numbers become the servants of governments and industry, it may well necessitate the development of a code of professional ethics, comparable to those of the legal and medical professions. Certainly this Association should be the logical body to formulate such a code if the need arises.

ERWIN RAISZ. (Introduced by Derwent Whittlesey.)

*Physiographic Maps of the Sahara Desert and Adjacent Regions.*

The author presents various small scale physiographic maps of the Sahara Desert and adjacent regions, showing type regions with distinct physiographic characteristics. The differences in the usage of desert terminology are discussed.

GEORGE T. RENNER AND CLARENCE I. HENDRICKSON. (Introduced by George T. Renner.)

*A Statistical Approach to Regions.*

(To be published in full in a later issue.)

VERA E. RIGDON. (Introduced by N. A. Bengtson.)

*Physiographic Nomenclature à la William Morris Davis.*

When William Morris Davis directed his efforts toward the systematization of the science of physical geography he faced the handicap of a lack of a technical vocabulary. New concepts which attended the growth of the new science needed new names—names which not only identified earth features but which also described and explained them. Davis introduced and helped to popularize many terms which have provided the foundations for an extensive terminology in physiography. He attempted to introduce those words which in themselves carried an explanatory description of land forms.

Of all the words whose origin or first use in physiographic literature may be traced to Davis, some perished, some survived but did not gain wide usage, while many soon became current both at home and abroad.

Some terms perished soon after they were invented, thus evincing the fact that other writers did not find them useful. For example the terms "elbow of capture," "eyebrow scarp," and "quilted surface" apparently failed to find favor with writers other than their inventor. The term

"skiou" presented as an experiment to a group of European and American geographers might have survived if Davis himself had not replaced it with a word having some power of connotation. The term "cobark," built up from the initial letters of the descriptive phrase "cut-out-behind-a-rock knob," apparently has not been generally accepted. It is of such recent invention, however, that it is impossible at this time to predict the extent of its future currency.

Some of Davis's terms have proved useful to only a few others. For example, "ontography" which he coined in 1902 has appeared in the writings of men who studied with him but the present writer has found no use of this word by any other authors. The term "morvan" which he introduced with a generic quality to replace the experimental term "skiou" has gained considerable currency in Europe. However, it has not been used generally in America—perhaps because Davis tried to crowd too much explanation into one short word.

Most of Davis's terms have become a permanent part of the equipment of scientific literature and many have proved of sufficient general usefulness to be included, with his interpretation or definition, in Webster's collegiate dictionary. Examples of these most common terms are "monadnock," "rejuvenate," "antecedent," "consequent," "base-level," and "youthful" and "old" as applied to stages in the cycle of erosion. Among others which are in general use by all physiographers are "stream piracy," "geographical cycle," and "drowned river."

JOHN KERR ROSE. (Introduced by Griffith Taylor.)

*Corn, Climate, and Statistical Method in the Corn Belt.*

Variation in the annual per acre yield of corn is a major practical problem of the Corn Belt. Such variation from year to year is largely to be correlated with variations in climate. Former investigators of the problem have used state averages of corn yield and climatic factors, or they have limited their investigations to one or two counties. Thus regional differentiation has hardly been possible.

Areal differentiation is a major objective of geographic study. To this end fifty-five sample counties located within the Corn Belt and just beyond its margins were selected as the areal units of investigation. Numerous climatic factors, most of them for monthly periods and for the years 1914 to 1932, were correlated with corn yields for the same years. The resulting correlation coefficients for each factor were mapped and isoplethed. Multiple correlations involving as many as seven climatic factors were run for each of twenty-nine of the selected counties. Multiple and partial coefficients of correlation were also mapped.

The results seem to have justified the long hours spent in the statistical computation on several counts. For one, some weather factors gave correlation coefficients high enough so that accurate corn yield forecasting in some areas seems possible. For another, the study proves the desirability of analysing geographic data by a method frequently employed in other social sciences but seldom (up to now) in geography. Finally, new information regarding areal differentiation of the Corn Belt is available.

Maps presented and discussed were: (1) Several maps showing areal distribution of simple and partial correlation coefficients between corn yield and specific factors; (2) a map showing areal distribution multiple correlation coefficients: (3) a map showing tentative divisions of the Corn Belt on the basis of significant correlations obtained.

RICHARD JOEL RUSSELL.

*Coastal Marshes of Southwestern Louisiana.*

In Cameron and Vermilion Parishes of southwestern Louisiana a coastal marsh zone, from 20 to 30 miles in width, stands near sea-level in elevation. Its inland portions have been depressed so as to form several large lakes and bays. Rising above general marsh level are the natural levees of existing and abandoned streams and several cheniers, sandy ridges roughly paralleling the coast. Along the shore of the Gulf of Mexico the marsh is being eroded by waves and a sandy beach is being formed and driven inland. As the marsh is now disappearing, both as the result of subsidence and of wave erosion, it is evident that the conditions under which it was formed no longer exist.

The coastal marshes originated during periods when the Mississippi River discharged west of its existing mouth. Periods of eastward discharge occurred at times and allowed the shore to retreat. Beaches were formed under such conditions. When westward discharge again occurred the marsh advanced into the Gulf leaving the most recent beach stranded inland, becoming a chenier. Subsidence, due to the increasing weight of the Mississippi Delta, occurred throughout the whole history of marsh growth and is still in progress. The highest cheniers and least flooded marsh are nearest the existing coast for the reason that the marsh there is youngest and has suffered least submergence.

J. RUSSELL SMITH.

*Are We Free to Coin New Tterms?*

(Published in full in this issue.)

THOMAS R. SMITH. (Introduced by J. Russell Smith.)

*The World Wheat Surplus.*

The recent rise of wheat prices in response to crop shortages makes pertinent a brief consideration of the possibilities for a more lasting revival of this branch of agriculture. A recovery of world economic conditions and a continuation of the present short crops would remove the existing wheat surplus and cause a further advance in prices. This improvement, however, would not be permanent in view of the existence of more basic causes influencing the surplus condition.

The first of these factors is the existence of a surplus tendency prior to the depression. This is shown by the accumulation of excess stocks and the attendant price decline in wheat which started as early as 1926. The tendency was largely due to: (1) The continued expansion of wheat acreage in Argentina, Australia, Canada and the United States in the years 1910–1929; due, first, to the stimulation of the World War and, second, to the credit situation which existed in these countries during 1924–1929. (2) The efforts of Europe to regain pre-war levels of production. These levels were finally reached during the years 1926–1933. (3) The failure of consumption to keep pace with the expanding capacity to produce wheat. It was upon the resulting unstable situation that, after 1929, the forces of depression and more abundant crops acted to intensify the surplus and make more rapid the decline of prices.

From this situation emerged the second factor of basic importance; namely, the efforts of leading European countries to protect their own producers of wheat. Arising from the desire of these countries for self-sufficiency and for the maintenance of a stable, prosperous peasant class this protectionism has been an important factor in curtailing the European demand for imported wheat. Despite the present tendency in France to loosen somewhat the import restrictions, some measure of protection for European agriculture seems likely to remain. It seems impossible that any of the European importing nations will be satisfied with less than pre-war levels of production and acreage. The experiences of the 1926–1929 period indicate that this would probably result in a tendency toward surplus accumulation, unless there was some curtailment of production in exporting countries.

The conclusion seems inescapable that in view of the levels of consumption, even during periods of prosperity, productive capacity has been overexpanded, and some reduction of acreage, most probably among the exporting countries, will have to precede a more lasting recovery of wheat prices. A permanent improvement in the situation can only come about through a willingness to increase international trade, and a wider distribution of purchasing power among people of a lower standard of living.

FLOYD A. STILGENBAUER. (Introduced by Wallace W. Atwood.)

*A New Population Map of Detroit, Michigan.*

This map is a detailed representation of the distribution, density, and agglomeration of people in one of America's major cities. The author believes it is the first detailed urban population pattern of a large city to come into being.

A total of 67,115 black dots were used to represent 1,677,889 people in the city of Detroit including the encompassed cities of Hamtramck and Highland Park. Federal census data of 1930 were broken up into 923 census tracts, and a detailed field study made of the housing capacity of the entire city in order to place the dots in accordance with the distribution and agglomeration of the inhabitants. One dot equals 25 people.

The density of people per square mile on any part of the map may be ascertained by laying off one of the small squares of one-sixteenth of a square mile on the map (or better still, by shaping a small copper wire the size of one of these squares), counting the number of dots within, and multiplying the result by 400.

Commercial centers, factory sites, transportation lines, parks, school sites, cemeteries, airports, vacant subdivision lands, and all other empty spaces stand out in white. Agglomerations about factory sites, the negro section, superior residential sites, apartment house agglomerations, the commercial, industrial, and transportational use along the water front, the factory concentration along the railways are outstanding features. Only streets bounding census tracts are placed on the map. An inset giving the names of these streets is included. Main thoroughfares, having retail stores, that are not census tract boundaries are left vacant where the conditions warrant.

ROBERT G. STONE. (Introduced by C. F. Brooks.)

*On Some Possibilities and Limitations of Air Mass Climatology.*

Air mass climatology, a recently suggested phase of dynamic climatology, consists of systematic observation of the frequency of Front passages and air masses, and study of the distribution of the weather elements with respect to each air mass type.

The conservatism and distinctiveness of the properties of types of air masses—Tropical and Polar, Maritime and Continental—give it tangible identity with the same rational meaning in theoretical dynamic meteorology as in practical synoptic meteorology and in climatology. Thus the climate is describable in terms of sequences and frequencies of air masses of given types each having known and specifiable values of the elements important in meteorological calculus and in climate; it is constructed like a building,

with blocks of limited variety and definite properties. This scheme presents the advantages of rationality and of harmony between practical and theoretical concepts.

Practical air mass climatology averages each weather element separately for each air mass type. All these statistical indices of the elements are computed for each air mass type for every month, season, pentad, or year. From them the climatic normals are determined for each air mass and, along with the normal frequencies of each air mass, they describe the climate in terms at once quantitative and directly relatable to the weather map. Climatic charts are drawn for each air mass.

The value of the scheme depends on the classification of air masses. That adopted by the synoptic meteorologists appears feasible for climatic purposes, but the climatologist may have to subdivide the categories as to age of the air mass, topographic situation of stations, and other local modifying factors. Fronts are often so diffuse that arbitrary or questionable distinctions may have to be made. Weather maps are available for 8 a. m. or 8 p. m. only and may not suffice to determine the situation at intermediate hours. Detailed study from automatic registrations of the elements requires practical knowledge of air mass analysis, automatic records are available for few stations, and the statistical tedium is great. Many years of air mass maps will have to be compiled before normals by air masses can be computed.

Even if the air mass approach to climate will not soon be widely adopted its possibilities should be explored. Out of it may come the needed basis for a genetic classification of climates; it represents a trend away from the empirical to the rational. Already European meteorologists have applied the air mass approach with fruitful results to problems of micro-climates, plant geography, and frost damage.

HELEN M. STRONG.

*Regionalism in the Manufacturing Industry.*

The manufacturing industry of the United States during the three hundred and more years since the settlement of the country has assumed a regional pattern in its distribution. This pattern finds its origin in the fundament, as definitely as do regional expressions of such other industries as agriculture. The Census of Manufactures for 1929, in its published and unpublished schedules, presents three lists of manufacturing countries, all of which, when mapped, reveal a regional pattern in their distribution.

The largest group includes all counties reporting 10,000 or more wage earners, and in addition, two counties from each state not thus represented, providing they had 4,000 wage earners, with the exception of Dade County,

Florida, which had only 2,398 wage earners. These 198 counties and the city areas of Baltimore and St. Louis accounted in 1929 for three-fourths of the nation's wage earners and 78 per cent of the value of products for the United States.

If only the 95 counties and two cities employing 10,000 and more wage earners are considered, these are found to cover only 94,000 of the entire 3,000,000 square miles for the United States. Here live nearly half the people of the country, and 70 per cent of the wage earners who produce five-sevenths of the entire value of manufactures for the United States.

There were 33 areas in the United States in 1929 employing 40,000 or more wage earners each, where 55 per cent of the wage earners of the country lived and produced more than four-sevenths of the total value of manufactures.

When these manufacturing concentrations were mapped in relation to Physiographic Regions, they were found to be grouped at focal points on the Interior Plain or Coastal regions such as San Francisco, Chicago, and New York, on or accessible to raw materials, and from which finished manufactures may be shipped; or along natural or other highways such as the Mohawk Valley, the Piedmont, or the Appalachian Valleys. Practically every important industrial center lies near the 70 or 60 degree (F.) summer isotherm and the 20, 30, or 40 degree winter isotherm. They are all in regions where a rainfall of more than 20 inches provides humid conditions.

Maps showing distribution of the manufacture of motor vehicles, cotton goods mills; canning and preserving of fruits and vegetables; iron and steel, steel works and rolling mills reveal distinctive regional groupings. The facts as to localization of manufactures shown by the Census, when compared with the regional layout of various elements in the physical environment reveal that the pattern of manufacturing areas for the country is consequent on the fundament which conduces to regionalism in location of manufacturing.

C. Warren Thornthwaite.

*Internal Migration in the United States.*

During the eighteenth century internal migration concerned an agricultural population and was associated with the colonization of new land. As the aborigines were displaced or exterminated it was obvious that it was through immigration that the released territory was reoccupied. Natural increase of population was rapid among the original settlers and after the first seeding of a new area an increasing proportion of the growth was due to internal expansion. In each area, therefore, there was first a decline in

immigration and presently when the region could no longer absorb even the natural increase, a net emigration.

Particularly since the beginning of the twentieth century migration has been principally to the cities. With a higher reproduction rate in the country than in the city and economic advantage continually favoring the city, it was to be expected that as soon as all the agricultural lands were appropriated the currents of migration would have been from country to city. Migrants from the American farming areas joined the vast number of immigrants from abroad in the rapid building of the urban centers. From 1920 to 1930 with foreign immigration largely checked, the internal cityward movement assumed enormous proportions. More than six million people left the farms during the decade.

There is an age selection in this rural-urban migration. Young people, especially between ages from fifteen to thirty, moved to the cities in largest numbers. From most of the industrial cities there has been an actual net emigration of people over forty. This is true particularly of the men.

Except in isolated areas population has achieved a remarkable mobility. Fewer than half of the families in the United States are bound to a locality by ties of home ownership, and the automobile has destroyed all respect for distance. Since the beginning of the depression people have been leaving the cities in large numbers. Much of the movement from the industrial areas has been to submarginal land where subsistence agriculture provides temporary refuge, but there has also been a limited movement to the villages and in some areas to the better farm land.

No data deal specifically with the quantitative aspects of migration within the United States. However, from several sorts of data it is possible to derive approximate figures on migration. They include: state of birth data and age-group data of the Census, vital statistics, school census figures, and school transfer records.

SAMUEL VAN VALKENBURG.
*Statistical Approach to Regions.*
(To be published in full in a later issue.)

HAROLD B. WARD. (Introduced by William H. Haas.)
*The Development of Manufacturing in Hamilton, Ontario.*

Hamilton ranks fifth in population among the cities of Canada but is third in value of manufactured products. It is proportionately the most largely dependent upon manufacturing of the leading Canadian industrial cities. In normal times about 45% of Hamilton's gainfully employed population work in manufacturing establishments.

Hamilton has developed into a distinctive manufacturing center largely because of certain definite factors, the influences of which have been cumulative throughout the history of the city. In large measure the favorable factors have outweighed the unfavorable factors or disadvantages. The chief advantages are classified into twenty-four groups and the unfavorable or partially unfavorable factors into ten groups.

DERWENT WHITTLESEY.

*Sequent Occupance in "Old" Boston.*

Metamorphoses in functions and forms in the core of a North American conurbation. (I) The site is the line of contact between navigable ocean and one of the larger New England lowlands; a triple headland made by three drumlins linked by lower-lying ground moraine. (II) The settlement of farmers and traders from overseas attaches itself at the deepest gulf on the seaward side, and reaches out to the "Great Spring" nearby. Occupance utilizes only the face of the peninsula. (III) As a rebellious colonial capital the town presses upon the limits of the morainal lowland, and has two residential foci. Tidal flats begin to be reclaimed and bridges link the headland to the mainland. Neighborhoods are differentiating according to function. (IV) A congested regional capital, the "Hub," with turnpikes and railroads as spokes in the wheel. Route terminals on "made" land, an idea extended to serve business and residence as well. Expansion of business isolates one of the old drumlin residential centers; the other drumlins are levelled or reduced and covered with buildings. The original headland is largely deserted by its residents in favor of the Back Bay filled tidal flat and commuters' suburbs; immigrants and negroes take up the abandoned quarters. (V) The core of a major conurbation adjusts itself to the new stresses of occupance. In the business district functional agglomeration increases; expanding, this quarter encroaches upon the residential area; the residential districts alter their locale and their character in conformance. The pattern of circulation is modified by the consolidation of railroad terminals, the creation of underground and overhead rapid transit, the opening of automobile routes used by public as well as private carriers. Motor routes are laid out on newly reclaimed ground or are cut through decadent quarters. (VI) Changes in the materials of construction, the intensity of land coverage, and the style of architecture accompany the several stages of occupance.

T. YATES WILSON. (Introduced by Charles G. Adams.)

*A New Method for Making Relief Models.*

The paper presents a new method for economically making relief models for educational purposes. The method described utilizes inverted profiles rather than contour discs or pins to determine the relief and eliminates the step of casting a mold by constructing a mold directly rather than a model to be subsequently copied. A scheme using a phantom model or stereogram for demonstrating subsurface structure sections is also suggested.

JOHN K. WRIGHT.

*Brief Report on the International Congress of Geography, Warsaw, August 23–31, 1934.*

*Editor's Note.* In this informal talk Dr. Wright summarized the work of the Fourteenth International Congress, discussing both the section meetings and the field excursions. In addition he presented maps tracing, both by absolute numbers of papers and by percentages, the trend of geography as reflected by the international congresses since 1913.

A detailed report on the Warsaw Congress by Dr. Wright is published in the *Geographical Review,* January, 1935, vol. XXV, pp. 142–8.

# Exhibits at the Philadelphia Meeting

In addition to the maps which formed cardinal elements of most of the papers given at Philadelphia, several rooms were hung with examples of current cartography.

The largest unit comprised the findings of the Regional Planning Federation of the Philadelphia Tri-State District. The survey, completed in 1932, includes not only Philadelphia and its contiguous suburbs, but also country, town, and city within a radius reaching beyond Wilmington, Delaware. Hundreds of maps were required to assemble the data collected in this investigation. About two dozen of these were shown at the meeting —examples of the various types of maps submitted in the final report of the Federation.

From the University of Michigan came a series of weather maps for eight days in November, 1934, selected to illustrate a normal sequence of air-mass movements across North America. Appended to each map was a brief descriptive note by Jerome K. Namias, of the University of Michigan. The maps were originally prepared by Professor H. C. Willett, of the Massachusetts of Technology.

Physiographic diagrams and maps drawn from airplane photographs were principal items in a large show of cartographic work of the Institute of Geographical Exploration of Harvard University.

Several of the maps used to illustrate papers were subsequently hung in the exhibit.

As has been their custom for many years, the leading map-making houses of the United States set up comprehensive displays of their recent publications—chiefly wall maps and atlases. They also exhibited new maps issued by the European firms which they severally represent.

### A PAMPHLET ON PHILADELPHIA

Another item, although not strictly an exhibit, deserves special mention. The Geographical Society of Philadelphia devoted its current quarterly *Bulletin* to "Philadelphia—Its Site and Situation," and generously distributed copies to those in attendance at the meetings. In four chapters the geography of Philadelphia is traced from "The Physical Site of Penn's Greene Towne," through "The Situation and Growth of Philadelphia" and "Modern Philadelphia," to "The Regional Plan and Some of its Proposals." This issue is the work of members of the Department of Geography at the University of Pennsylvania.